Brain Failure: Some Lessons

K Srinivasan

INTRODUCTION
This refers to disordered quality of life and behavior in a person, ambulant and socially active, without visual, motor or sensory deficits. This subject is also referred to as behavioral or cognitive neurology. Major aspects relate to aphasias (language disorder), amnesias, agnosia (failure to recognize use and nature of animate or inanimate objects or spatial disorientation), apraxias (inability to perform a learned, routine skill in the absence of paralysis), all despite good attention and concentration. Socially inappropriate, uninhibited or impulsive behavior, without a psychiatric disorder also extends this spectrum!

This chapter deals only with amnesias and guides the clinical diagnosis.

AMNESIA—MEMORY FAILURE
Memory is bilaterally represented, basically in the limbic system (medial temporal lobe with amygdala, hippocampus, etc. connected to medial thalamus, hypothalamus and basal frontal lobes). Unilateral lesions do not cause gross memory deficits and if a patient has it, suspect bilateral or metabolic causes (alcohol, B, Defy, hypoxia, hypoglycemia, etc.).

Case 1
Adult male, smoker, had headaches, and left temporal lobe mass. Surgery was postponed in view of memory deficits implying bilateral lesion. Six months later, diagnosis was obvious: lung carcinoma with multiple brain metastases.

However, clear verbal memory deficits can lateralize the lesion to left brain, and nonverbal, visuospatial deficits point the source to rightbrain.

Case 2
Engineer, 50 years old male, draftsman, improved after unilateral anterior temporal lobectomy for temporal lobe epilepsy (TLE) (psychomotor seizures).

He had a specific problem. In the office, he drew and labeled the structural plan. When interrupted by a phone call, or messenger, or coffee break, he cannot continue the sequence; will tear and throw the paper bits into dustbin. With many such interruptions, the drawing plan remained unfinished but the wastepaper basket was full!!

Wilder Penfield, the famous Canadian neurosurgeon who had earlier operated on him, followed the case for 10 years, till the patient died of myocardial infarction (MI). Postmortem examination showed that the unoperated opposite medial temporal lobe was scarred and atrophied, proving that memory is a bilateral function, and that current or working memory needs intact hippocampus, amygdala, etc. on both sides.

Age-related memory loss starts often with naming defects, not dementia. However, mild cognitive impairment (MCI) with normal activity of daily living (ADL) may proceed to dementia later.

The amnesic form of MCI is a risk factor. 15% in 1 year and 80% in 6 years are diagnosed as Alzheimer’s disease (AD) where hippocampal atrophy and memory defects are characteristic. In the early stages, angiotensin-converting enzyme inhibitors (ACEIs) and cholinesterase inhibitors help to improve memory.

Transient Global Amnesia
It occurs in elderly, episodes with disorientation to persons, place and time, amnesic automatisms (may go out of office, drive his car return to resume work, unaware of his action, appear confused); retrograde memory improves but has ictal amnesia. Personal identity and insight are normal.

It is provoked by emotional or physical stress. For example, sexual exercise may often be causative.

Differential Diagnosis
- Migraine
- Temporal lobe epilepsy.
  Most likely cause is now considered to be posterior cerebral artery (PCA)-related ischemia.

Anoxic Ischemic Lesion
For example, after cardiorespiratory arrest and survival cause anterograde amnesia (hippocampal), also in herpes encephalitis. Benzodiazepines also impair retrograde memories more than anterograde memories.

Chronic Alcoholism; Wernicke-Korsakoff Syndrome (WKS)
- Amnesic-confabulatory psychosis, anterograde amnesia (verbal, nonverbal, coding, retrieval affected)
- Retrograde amnesia: Preceding events are graded.
  - Graded, i.e. remote past unaffected. Spares non-declarative aspects, i.e. habits, skills. Apathy. Attention normal.

Confabulation
It is denial of amnesia, forget that they forget and fill the gaps with fabricated information. Disorientation is noted because of amnesia. Test words are repeated but not recalled 5-10 minutes later, i.e. storage and retrieval are impaired.
Nystagmus, ataxia and peripheral neuropathy are also present. It is caused by lesions in the mammillary bodies and medial thalamus.

**Treatment:** Early intake of vitamin B prevents prolonged misery. Vitamin B$_1$, 50–100 mg orally for months is also useful.

**Anterograde Memory**
To absorb new information (postictal): localized to hippocampal areas.

**Retrograde Memory**
Preceding ictus inferomedial frontal lobe and lateral temporal lobe; storage of memory is beyond the limbic system, in the hemispheres.
After traumatic brain injury retrograde amnesia shrinks with time; road traffic accident (RTA) predicts more severe brain injury; more than longer anterograde amnesia. Both are significant.

**Semantic Memory**
- Unchanged for MS—days of week, months of year, etc. (anterior temporal lobe)
- Inferior, post-temporal lobe—agnosias prosopagnosia. Fail to recognize faces and expressions. Bilateral—occipito temporal, right more—lingual gyrus on going activity.

**Working Memory: Relating to on Going Actions**
- Decays fast if not rehearsed and stored
- Localized to hippocampus
- Test serial 7, digit span 5–7 backward, or bits of information.

**Episodic, Explicit or Long-term Declarative Memory**
- Facts, concepts, language, (Mind’s eye)
- Famous faces
- **Localization:** Anterior temporal lobe, neocortex N-methyl-D-aspartate (NMDA) receptors needed
- Word list (L), shapes (R), recall impaired
- Now declarative; implicit procedural habits

**Blood Supply**
Polar, paramedian branches of PCA and anterior internal carotid artery (ICA) and posterior choroidal arteries (PChAs) supply hippocampus since postcirculation is the main supply of limbic memory system. Memory deficits are not primary features of vascular dementia, since most ischemic strokes are in the anterior circulation.
Middle cerebral artery supply to parietal lobes; important for verbal (L) and nonverbal (R) memory; anterior cerebral artery (ACA) for frontal lobe related functions (executive memory, insight judgment, emotions).

**Pseudodementia**
It refers to depression as a major cause with psychomotor retardation, normal attention and concentration, impaired working memory. Antidepressants improve both mood and memory.

**Psychogenic Amnesia (Prolonged Fugue States)**
Psychogenic amnesia (prolonged fugue states) is noted when the patient may wander outside their residence; claim loss of identity of self or partial expression; often event-specific. Recent memory and capacity to learn and use new information intact.
Remote or long-term memory loss is very rare in organic lesions.
Memory failure occurs in dementias, Alzheimer’s, other cortical lesion, reversible causes like normal pressure hydrocephalus (NPH), deficiencies of vitamin B$_12$, thyroxine, and vitamin B$_6$, limbic encephalitis [herpes simplex encephalitis (HSE), paraneoplastic, etc.], traumatic brain injury, neoplasms ischemic and hemorrhagic strokes, drug addiction, etc.

**Note**
- Global memory failure is common only with bilateral lesions or extracerebral toxic or metabolic causes.
- Hippocampal complex with limbic system is the key player to record, and recall primarily and help storage. Depth electrodes can activate forgotten long-term memories.