INTRODUCTION

Dementia is defined as a progressive impairment of cognitive functions occurring in clear consciousness (i.e. in absence of delirium). Dementia word is derived from Latin word "dementatis" meaning out of one's mind. Various causes exist for dementia among which Alzheimer's disease accounts for more than 60% of cases. A recent text version of DSM-IV (DSM-IV-TR) has been developed with six categories of dementia: Alzheimer's type, vascular, due to general medical conditions, due to multiple etiologies, substance induced including alcohol, and dementia not otherwise specified. The DSM-IV-TR emphasizes the resultant decline from a previously attained level of functioning to meet diagnostic criteria. The tenth edition of ICD-10 classification maintains a syndromic approach to specific criteria and includes four dementia categories: dementia in Alzheimer's disease, vascular dementia, dementia in other disease classified elsewhere, and unspecified dementia. ICD-10 also has a general dementia criteria that divide severity into mild, moderate, and severe. Unlike the DSM-IV-TR the ICD-10 does not include functional impairment criteria, instead states that cognitive decline must be sufficient to interfere with activities of daily living.

The concept of reversible dementia was introduced in 1980 when a task force sponsored by National Institute of Aging found 10-12% of dementia cases in older group to have reversible causes such as metabolic-nutritional, drugs, infections, psychiatric disorders (depression) etc. Some conditions which result in cognitive impairment not fulfilling the criteria of dementia or conditions inducing personality changes or intermediate between dementia and delirium are treatable and called reversible dementia. However not all can be reversed completely. The potential reversibility may depend upon detection and treatment before the criteria for are fulfilled if failing to do so would lead to dementia.

Causes of reversible dementias:

- Intoxications:
  - Medications like Alfamethyldopa, digitalis, lithium, beta blockers, alpraxolam, clonazepam, opiates, and antihistamines
  - Substance abuse including alcohol
  - Heavy metals like lead, mercury and arsenic
- Infection of the central nervous system:
  - Chronic bacterial meningitis or partially treated meningitis
  - Neurosyphilis in AIDS patients and otherwise.
- Chronic infections like tuberculous meningitis or tuberculoma
- Herpes encephalitis
- AIDS dementia complex: This is the most frequent neurological complication of AIDS
- Neurocysticercosis.

- **Metabolic/Nutritional:**
  - Hypo/hyperthyroidism
  - Hypo/ hyperglycemia
  - Parathyroid disease
  - Wilson's disease
  - Vitamin B1 deficiency can cause Wernicke's encephalopathy and then Korsakoff's demetia
  - Vitamin B12 deficiency
  - Folate deficiency usually results from poor dietary intake, frequently facilitated by alcoholism. May produce irritability, memory loss, personality changes. It is reversible if corrected early.

- **Structural and neoplastic:**
  - Hydrocephalus including obstructive and normal pressure hydrocephalus.
  - Subdural hematomas especially chronic.
  - Intra-cranial tumors (meningiomas).

- **Psychiatric disorders:**
  - Sleep apnea syndrome.
  - Pseudodementia (depression)

- **Cancer Treatment**
  - Chemotherapy
  - Radiation therapy

**Causes of Non-remediable dementias:**
- Alzheimer's disease: This accounts for 50% of the dementias
- Vascular dementia
- Pick's disease
- Fronto temporal atrophy without picks bodies
- Lewy body disease
- Spinocerebellar degeneration
- Parkinson's disease
- Huntington's chorea
- Inflammatory conditions like multiple sclerosis, lupus erythematosis, sarcoidosis, Sjogren's syndrome
- Infectious disease with slow virus causes Creutzfeldt-Jakob disease
- Binswanger's disease
- Delayed effect after brain irradiation
• Hypoxic encephalopathy
• Traumatic- after severe head injury

PREVALENCE OF REVERSIBLE CAUSES OF DEMENTIA

WESTERN STUDIES

Dementia is one of the most common disabling disorders afflicting the elderly with staggering emotional and economic impact. It has achieved silent epidemic proportions not only in the West but in countries such as India too. The reported frequency of dementia in the community dwelling adults older than 65 years is 3-11% and increases as the population ages further.

The reported frequency of dementia due to potentially reversible causes varies from 0 to 23%.[14,15,59] Commonest among these causes are alcohol and medication related dementia, depression induced cognitive impairment, surgical brain lesions such as normal pressure hydrocephalus [NPH], tumors and chronic subdural hematomas, metabolic disorders such as hypothyroidism, hypoparathyroidism, vitamin B12 deficiency and central nervous system (CNS) infections such as neurosyphilis and HIV.[47]

The availability of specific treatment modalities for almost all dementia subtypes makes comprehensive evaluation imperative so that potentially reversible factors contributing to the dementia syndrome can be identified and treated.

Recent large studies of reversible dementias from the West have not found CNS infections as causes of dementia.[22,28]

INDIAN STUDIES

The prevalence of dementia in India has been shown to vary from 0.84% to 3.5%[11,50,52,53,56] in various studies. However studies from developing countries such as India[50] and Brazil mentioned neuroinfections especially neurosyphilis as rather common. The high prevalence of CNS tuberculosis and neurocysticercosis together with the looming spectre of HIV infection in countries such as India would continue to ensure that neuroinfections reign as common causes of reversible dementia in the near future.

However, the cost of investigating for a few causes that might be reversible has to be balanced against the benefit that would accrue to the patient in whom such a cause is identified and treated. This question is all the more important in a country like India, where on one hand the proportion of patients with dementia attributable to reversible etiologies is suspected to be higher than in the West while on the other hand the resources available to diagnose them are limited. Given these constraints careful selection of patients with dementia for work up for reversible causes assumes great importance.

INITIAL EVALUATION OF SUSPECTED DEMENTIA CASES TO DISTINGUISH “REVERSIBLE” CAUSES:

The first responsibility of the clinician is to identify potentially reversible causes of dementia. Clearly age of onset is a very important consideration. Treatable causes of dementia occur in 21% of those under 65 and 5% of those over 65%. Unfortunately, even in the potentially treatable group of illnesses, response rate is not 100%. In the largest composite study, where the incidence was 13%, 3%
demonstrated complete recovery and 8% show partial recovery, leaving 2% with no response. Greatest chance for complete recovery occurs in patients suffering from depression, metabolic abnormalities such as hypothyroidism, and drug toxicity.\(^{(24)}\)

The second responsibility of the clinician is to identify coexisting medical conditions which may worsen the dementia. Called "co-morbidity" Undetected or untreated comorbid conditions may exacerbate an already existing cognitive impairment. The most common comorbid conditions affecting demented patients are: Parkinson's disease, depression, infections (particularly urinary tract, congestive heart failure, and chronic obstructive pulmonary disease.

**Comprehensive patient evaluation includes:**

1. A complete medical history and physical examination
2. Neurological and mental status assessments
3. Ancillary tests: blood and urine, electrocardiogram, electroencephalogram (EEG), lumbar puncture, imaging exam (CT or MRI), and brain biopsy).

1. **History**
   - Take a thorough history, including:
     * Medications
     * Approximate onset of symptoms
     * Drug and alcohol use
     * Opportunistic infection symptoms
     * Pain
     * HIV history, including duration, opportunistic illnesses, and CD4 levels
     * Query about common manifestations

2. **Screening Exam**
   - Ask patient to write name, date, and location; to spell "world" backwards; to perform memory-object recall of 3 objects after 5 minutes; and to make change from a dollar.
   - Perform thorough neurological examination, including funduscopic exam. Check symmetry of brow wrinkling, eyelid closure, and pupil size. Perform Romberg and other tests to rule out local neurologic deficits.
   - Check gait by asking patient to walk rapidly, turn, and stop. Ask patient to walk on heels and tiptoes. Test steadiness of gait with eyes open and closed. Ask patient to stand from a squat position without assistance.
   - Check temperature and other vital signs, and perform thorough physical examination to determine potential reversible causes such as opportunistic infections.
Algorithm for Initial Evaluation of Dementia

Clinical Suspicion of dementia
History and Physical examination

Mini-Mental State Examination (MMSE)

< 24

Assess for depression; consider using Geriatric Depression Scale or psychiatry consult

Positive

Consider neuropsychologic testing or subspecialist evaluation (i.e., neurology, psychiatry, geriatric medicine)

Negative

Treat for depression; reassess in three to six months

MMSE < 24

Work-up for reversible causes of dementia laboratory testing (thyroid-stimulating hormone, B12); consider neurologic imaging (see text)

Normal

Alzheimer's disease likely

Recheck every three months

Abnormal

Treat reversible cause.

Reevaluate cognition.

No Change

Alzheimer's disease likely

Improved

Recheck every three months
Indications for Testing:

In all cases, it is incumbent upon clinicians to support their clinical evaluation with some testing that both supports the diagnosis and attempts to uncover treatable or co-morbid conditions affecting the patient's dementia. The following section discusses several relevant testing possibilities and a proposed suggestion for their indications:

I. Initial Laboratory Evaluation

The purpose of laboratory testing is to exclude potentially reversible causes of dementia. The American Academy of Neurology recommends two laboratory tests for the initial evaluation of the patient with suspected dementia-thyroid function and vitamin B$_{12}$ level.\textsuperscript{[33]} The Second Canadian Consensus Conference on Dementia (CCCD) recommends obtaining results for complete blood cell count, thyroid-stimulating hormone level, serum electrolytes, serum calcium, and serum glucose to exclude potential infections or metabolic causes for cognitive impairment.\textsuperscript{[12]} Other testing, such as serology for syphilis, Lyme disease titer, human immunodeficiency virus (HIV), urinalysis, culture and sensitivity, heavy metal assays, erythrocyte sedimentation rate, liver function, serum folic acid level, or other vitamin level assays should be performed only when clinical suspicion warrants.

a. CBC, electrolytes and calcium, renal function, VDRL (if positive, order FTA-ABS), Thyroid function studies, B12 level, level of oxygenation.

b. Consider HIV testing, drug screening, toxin screen, collagen-vascular studies, general biochemical screens

II. Neuropsychologic Testing

Neuropsychologic testing can comprehensively assess multiple domains of higher cognitive functioning including intelligence and behavioral functioning. A trained psychologist or psychometrician performs neuropsychologic testing. Higher cognitive functioning (logical reasoning, abstract and conceptual reasoning, visuospatial orientation, constructional ability, abstract thinking, memory, verbal reasoning, verbal fluency, etc.) is evaluated. Neuropsychologic testing has the potential to identify cognitive impairment objectively in patients with higher baseline cognitive abilities. It also may reveal subtle cognitive impairment in persons with suspected cognitive impairment or dementia and in persons at increased risk of cognitive impairment,\textsuperscript{[44]} and may be useful in distinguishing patients with mild cognitive impairment from those with dementia.

Neuropsychologic testing may be considered as an adjunctive option for patients and families who are anxious to define and measure (in a standardized fashion) cognitive functioning and then monitor for changes over time. Other candidates for possible formal testing include persons who are not well educated, those who do not have English as their native language, and persons who are functioning "normally" or who are minimally impaired on screening. Although it can be useful in evaluating the impact of depression, anxiety, and other psychologic symptoms on cognitive functioning,\textsuperscript{[1]} neuropsychologic testing is not recommended routinely for all patients with suspected dementia.

III. EEG

a. Clinical history suggesting a seizure disorder (including fluctuating levels of consciousness or
transient brief episodes of behavior change)

b. Suspicion of Creutzfeldt-Jakob disease (CJD) based upon a history of rapid decline in cognitive function over 3 months or less, or ataxia, chorea, myoclonus early in the course of dementia and any extrapyramidal or cerebellar features that are not attributable to some other diagnosis.

c. Pseudodementia of depression

IV. Lumbar Puncture

A lumbar puncture is not recommended for routine evaluation, but should be considered for patients with suspected neurosyphilis, cerebral vasculitis, HIV infection, slow-virus diseases, or cerebral Lyme disease. Routine testing for genetic markers such as apolipoprotein E is not recommended.

a. Cognitive symptoms less than 1 month
b. History of connective tissue disease
c. Immunosuppression
d. CNS infection suspected
e. FTA-ABS positive
f. Diagnosis of meningeal spread of neoplasm
g. Dementia onset in person less than 55 years old.
h. Diagnosis of normal pressure hydrocephalus

V. Imaging Study

Neuroimaging may diagnose vascular disease, normal pressure hydrocephalus, tumors, abscess, or subdural hematoma. However, the yield from neuroimaging in identifying a potentially reversible cause of dementia is low.[32] Therefore, there is some controversy regarding the routine use of neuroimaging in the primary evaluation of dementia. The CCCD recommends the following criteria for neuroimaging: age younger than 60 years, atypical or rapid cognitive decline, recent head trauma, localized neurologic signs or symptoms, gait disturbance, urinary incontinence (early in the course of the dementia), use of anticoagulants, and history of cancer.[12] The American Academy of Neurology recommends that all patients have a magnetic resonance imaging study or noncontrast computed tomography as part of the initial evaluation.[33] The American College of Radiology recommends magnetic resonance imaging as the preferred study if one is chosen.[34]

Routine use of single photon emission computed tomography or positron emission tomography is not recommended by evidence-based guidelines or most experts.

a. Duration of cognitive complaints less than 6 months
b. Symptom onset before the age of 60
c. Focal signs, focal symptoms, or papilledema
d. Diagnosis of a seizure by history, or usual gait abnormalities (e.g., ataxia or apraxic gait)

VI. Brain biopsy

Clinical diagnosis of dementia should be considered as possible or probable, rather than definite. Definite diagnosis of a specific cause requires confirmation by tissue diagnosis either by biopsy or
examination of brain tissue at autopsy.

REVERSEBAL CONDITIONS CAUSING DEMENTIA

(A) INTOXICATIONS:

1. Medication-induced dementia

Medication-induced dementia is the most frequent cause of "reversible" dementia. Incidence of adverse drug reactions increases with age. Alterations in pharmacokinetics and pharmacodynamics, together with the presence of concomitant illnesses (especially renal, hepatic, and cardiac) and the number of prescribed and over-the-counter medications taken, all make older people more vulnerable to this. Take a thorough drug history by reviewing of all current medication (both prescription and over-the-counter). Have the patient bring into the office all their medication for inspection.

Medications That May Impair Mental Function

<table>
<thead>
<tr>
<th>Drug Category</th>
<th>Generic Name</th>
</tr>
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<tbody>
<tr>
<td>Allergy and cold medications</td>
<td>brompheniramine</td>
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<tr>
<td></td>
<td>chlorpheniramine</td>
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<tr>
<td></td>
<td>diphenhydramine</td>
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<td></td>
<td>pseudoephedrine</td>
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<tr>
<td>Antibiotics</td>
<td>cefalexin</td>
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<tr>
<td></td>
<td>ciprofloxacin</td>
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<tr>
<td></td>
<td>metronidazole</td>
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<tr>
<td></td>
<td>ofloxacin</td>
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<tr>
<td>Anticholinergic</td>
<td>Scopolamine</td>
</tr>
<tr>
<td>Anticonvulsants</td>
<td>carbamazepine</td>
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<tr>
<td></td>
<td>phenytoin</td>
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<tr>
<td></td>
<td>valproate</td>
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<tr>
<td>Antidepressants</td>
<td>amitriptyline</td>
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<tr>
<td></td>
<td>doxepin</td>
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<tr>
<td></td>
<td>desipramine</td>
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<tr>
<td></td>
<td>imipramine</td>
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<tr>
<td></td>
<td>nortriptyline</td>
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<tr>
<td>Antipsychotic drugs</td>
<td>chlorpromazine</td>
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<tr>
<td></td>
<td>haloperidol</td>
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<tr>
<td>Cancer drugs</td>
<td>chlorambucil</td>
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<tr>
<td></td>
<td>cytarabine</td>
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<td></td>
<td>interleukin-2 (aldesleukin)</td>
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<tr>
<td></td>
<td>amiodarone</td>
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<tr>
<td>Heart disease medications</td>
<td>digoxin</td>
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<tr>
<td></td>
<td>disopyramide</td>
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<tr>
<td></td>
<td>quinidine</td>
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<tr>
<td></td>
<td>tocaïnide</td>
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<tr>
<td>High blood pressure drugs</td>
<td>atenolol</td>
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<tr>
<td></td>
<td>methyldopa</td>
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<tr>
<td></td>
<td>metoprolol</td>
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<td></td>
<td>nifedipine</td>
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<td></td>
<td>prazosin</td>
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<td></td>
<td>propranol</td>
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<td></td>
<td>verapamil</td>
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</table>
STOPPING OR CHANGING MEDICATIONS THAT WORSEN CONFUSION OR THAT ARE NOT ESSENTIAL TO THE CARE OF THE PERSON MAY IMPROVE COGNITIVE FUNCTION

II. Alcohol.

Of the several toxins that can produce dementia, alcohol is associated with the highest frequency of dementia. The increasing incidence of alcoholism in older persons makes this an important consideration. Prolonged, heavy ingestion of alcohol may result in an amnestic disorder with cognitive deficits limited to memory impairment that is not a classic dementia by DSM-IV criteria. This disorder, Wernicke-Korsakoff syndrome, is generally attributed to associated thiamine deficiency. Alcohol amnestic syndrome often follows an acute episode of Wernicke's encephalopathy; if the Wernicke's encephalopathy is treated early, alcohol amnestic syndrome could be prevented. Once this syndrome is established, there is generally only slight improvement over time.

A dementia that does meet DSM-IV criteria, alcohol-induced persisting dementia, has also been associated with prolonged, heavy ingestion of alcohol. This dementia persists after alcohol intake has stopped, and the etiologic role of alcohol in this disorder is controversial. Other nutritional disorders, such as multiple vitamin, protein, and calorie deficiencies, occur commonly in chronic alcoholics and have been linked to cognitive impairment. Correcting these deficiencies may improve cognitive function to some extent.

III. Heavy metal toxicity

Heavy metal toxicity represents an uncommon, yet clinically significant, medical condition. If unrecognized or inappropriately treated, heavy metal toxicity can result in significant morbidity and mortality. Iatrogenic metal toxicity may occur with bismuth, gold, gallium, lithium, and aluminum species. However, occupational exposure to heavy metals has accounted for the vast majority of poisonings throughout human history. Toxic effects from chronic exposure to heavy metals are far more common than acute poisonings.

Chronic exposure may lead to a variety of conditions depending on the route of exposure and the metabolism and storage of the specific element in question. Exposure to copper can lead to its accumulation in liver, brain, kidney, and cornea, leading to the classic impairment and stigmata of Wilson disease and Indian childhood cirrhosis. Many of the heavy metals have been implicated as carcinogens in the setting of chronic exposure.

The most common species implicated in acute and/or chronic heavy metal toxicity are lead, arsenic, and mercury. Overall, lead is the most significant toxin of the heavy metals. Industrial decisions, such as the addition of lead to paints, dyes, and gasoline, have created an epidemic of lead poisonings.

History:

- A history of ingestion or exposure is the most critical aspect of diagnosing heavy metal toxicity. A complete history, including occupational, hobby, recreational, and environmental exposure is crucial in diagnosing heavy metal toxicity.
- Most acute presentations involve industrial exposure.
- A history of ingestion often leads to the diagnosis in children.
Physical:

- **Physical findings in lead toxicity vary with age and dose.**
  - Any combination of GI complaints, neurologic dysfunction, and anemia should prompt a search for lead toxicity.
  - GI complaints predominate in adults.
  - Children are more prone to CNS dysfunction, including encephalopathy. Encephalopathy is rare in adults. Encephalopathy may present as an acute event with seizures, or it may develop slowly over weeks to months with variable nonspecific complaints. Closely examine the patient's history to elicit evidence of heavy metal exposure (eg, foreign body ingestions, paint chips, retained bullets).
  - Look for "lead lines" at the gingival border.

- **As with lead, arsenic toxicity symptomatology varies with several factors, including concentration, rate of absorption, and the chemical form ingested.**
  - Cholera-like diarrhea can be seen in acute arsenic toxicity. Unlike the other heavy metals, thallium does not produce significant GI symptoms, and its hallmark is constipation.
  - Neurologic complaints ranging from neuropathy to encephalopathy have been reported in cases of acute arsenic toxicity. Arsenic toxicity presenting as ascending flaccid paralysis is often confused with Guillain-Barré syndrome.
  - Acute renal failure is not uncommon and, when observed, is often fatal.

- **Mercury toxicity often presents with CNS dysfunction (eg, erethism)**
  - Chronic exposure may lead to an intention tremor, the most consistent neurological finding in chronic toxicity.
  - Inorganic forms of mercury may cause severe GI complaints (eg, corrosive esophagitis, hematochezia)
  - Acrodynia (ie, Pink disease) is observed in children with mercury toxicity.
  - Physical findings include rash and desquamation of the face, palms, and soles. Gingivitis, stomatitis, and salivation are frequently noted

**Treatment**

1. Pb: Chelation with ca EDTA, dimercaprol, penicillamine
2. As: Chelation with dimercaprol (BAL)
3. Hg: Chelation with succimer, dimercaprol, and penicillamine

**(B) INFECTIONS AS A CAUSE FOR DEMENTIA**

**IV. HIV**

It is well known that HIV-1 DNA is present in the brains of both asymptomatic and symptomatic individuals. The HIV virus is neurotropic and directly invades brain tissue shortly after infection. HIV may cause cognitive difficulties, including HIV-associated dementia (HAD), also called AIDS dementia complex (ADC). The virus has been shown to pass the blood-brain barrier early in the course of infection. Immune activation is associated with neuronal damage. HIV-1 involvement can be classified as follows:
• Subclinical impairment
• Minor cognitive-motor disorder (MCMD)
  i. Diagnostic criteria for MCMD include at least two of the following symptoms for at least 1 month by self-report, confirmed by either clinical neurologic examination or by neuropsychologic testing
  ii. cognitive: impaired attention or concentration, mental slowing, impaired memory
  iii. motor: slowed movements, incoordination
  iv. emotional: personality change or irritability or emotional lability
  v. exclusion of other causes of cognitive-motor impairment.

• HIV-1–associated dementia (HAD) or AIDS- dementia complex.
  i. HAD is thought to generally be a sub-cortical dementia. Diagnostic criteria include: cognitive dysfunction in at least two cognitive functions for at least 1 month by self-report with objective verification by neuropsychologic testing or by clinical neurologic examination;
  ii. moderate to severe functional status decrements
  iii. exclusion of other causes of cognitive-motor impairment.

<table>
<thead>
<tr>
<th>HAD Stage</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Stage 0 (Normal)</td>
<td>Normal mental and motor function.</td>
</tr>
<tr>
<td>Stage 0.5 (Subclinical)</td>
<td>Equivocal symptoms of cognitive or motor dysfunction: no impairment of work or capacity for activities of daily living (ADL)</td>
</tr>
<tr>
<td>Stage 1 (Mild)</td>
<td>Evidence of intellectual or motor impairment but able to perform most ADL.</td>
</tr>
<tr>
<td>Stage 2 (Moderate)</td>
<td>Unable to work but can manage self-care.</td>
</tr>
<tr>
<td>Stage 3 (Severe)</td>
<td>Major intellectual incapacity or motor disability</td>
</tr>
<tr>
<td>Stage 4 (End-stage)</td>
<td>Nearly vegetative</td>
</tr>
</tbody>
</table>
Ref-[4]

Other associated conditions with HIV-individuals can cause cognitive impairment or dementia are listed below:

**HIV Associated Conditions — Viral Infection**

1. *Progressive Multifocal Leukoencephalopathy*

   PML occurs in up to 5% of all AIDS patients. PML is a demyelinating disease caused by papovavirus (JC virus — JCV) Lesions are white matter demyelination without mass effect. Most common presentations is: focal weakness, sensory disturbances, visual deficits (homonymous hemianopsia, quadrantanopsia, or cortical blindness in 50% of PML cases), and cognitive abnormalities. Cerebellar involvement with limb and trunk ataxia (10%). Dementia is rapidly advancing unlike HAD. Death within 4 months is common and 80% die within one year.

2. *Lymphoma*

   This is the most common primary brain neoplasm occurring in 1-4% on AIDS. This frequency in AIDS is 1,000 times greater than that expected in the general population. The incidence may increase as treatment for reduced CD4 counts improve. Present with memory loss, seizures, cranial nerve deficits (10%). Tumors are B cell in origin (95%) and have an aggressive histologic type (large cell or large cell immunoblastic) as opposed to the intermediate- to high-grade subtypes seen in non-AIDS cases. Almost always associated with EBV infection. Neuroimaging show homogeneously enhancing lesions found most frequently in the periventricular deep gray matter area or corpus callosum. Two thirds of will have multiple lesions on scanning, but virtually all have it at autopsy. CSF shows pleocytosis, elevated protein. Diagnosis is by brain biopsy Treatment is with radiation therapy and steroids.

**HIV Associated Conditions — Opportunistic infections (OIs)**

Develop frequently in association with HIV-1 infection. These opportunistic complications usually develop once the CD4 cell count is <200/mm. Since the introduction of anti-retrovirals (protease inhibitors) have enabled suppression of viral replication to very low levels, CD4 cell count levels have persisted for longer periods of time leading to partial and temporary restoration of the immune system. Therefore treatment has reduced the incidence of OIs.

**Parasitic**

1. *Toxoplasmosis:*
   
   i. Most common OI of the CNS in AIDS (5% and 15%).
   
   ii. Acquired by ingestion in undercooked meat. Primary infection is usually asymptomatic, or may manifest itself with regional lymphadenopathy or a mononucleosis-like illness.
   
   iii. Cerebral toxoplasmosis results from reactivation of a previously acquired T gondii infection during a period of immuno-compromise. Typically with CD4 cell count’s <100/mm.
   
   iv. Subacute presentation over days to weeks with lethargy, fever, headache, confusion, and focal signs (up to 75%). Seizures in up to 30%.
v. **Typical signs** are hemiparesis, hemianesthesia, apraxia, aphasia, and movement disorders (hemichorea and hemiballismus). Cerebellar and brain stem abnormalities are less common.

vi. Histopathologic changes vary from a localized granulomatous process to a diffuse necrotizing encephalitis. Can also have perivascular cuffing and frank vasculitis.

vii. Measurement of serum antitoxoplasma immunoglobulin G (IgG) antibodies occurs in less than 50%. CSF has mild elevation of protein and a mild to moderate mononucleated pleocytosis. However, not infrequently CSF findings can be normal.

viii. Neuroimaging, especially MR is extremely useful. Lesions (multiple in 66%) demonstrate ring or nodular enhancement in 90% of cases, and usually some surrounding mass effect is observed. Typical location is corticomedullary junction or in the basal ganglia.

ix. **Treatment** is with an antitoxoplasmosis regimen for 10 to 14 days (combination of pyrimethamine and sulfadiazine). Lifetime suppressive therapy with the same regimen at lower doses is highly recommended, since relapses are otherwise common. Primary prophylaxis is recommended for T gondii-seropositive patients with CD4 cell counts <100/mm.

**Fungal Infections**

**Cryptococcus**

i. Encapsulated yeast infection acquired through the respiratory tract. It is the most common CNS fungal infection in AIDS (5% to 10%) associated with CD4 cell counts of <100/mm.

ii. Meningitis is the chief clinical CNS event presenting with headache and fever (85%); nausea, vomiting, photophobia, blurred vision, stiff neck; and confusion and lethargy (about 30%).

iii. Focal neurologic deficits and seizures in about 10%.

iv. CSF with elevated opening pressure, increased protein, decreased glucose level, monocytic pleocytosis. Indian ink staining positive in more than 70%, positive cryptococcal antigen in 90%.

v. Neuroimaging is frequently negative

vi. **Treatment** with high-dose amphotericin B plus flucytosine for a minimum of 2 weeks, followed by oral fluconazole for 8 to 10 weeks or until CSF sterilization is achieved.

vii. Acute or subacute hydrocephalus should be treated aggressively.

**Other Fungal Infections**

i. These include: Candida (microabscesses, meningitis, and meningoencephalitis — treatment with amphotericin B); Aspergillosis (subacute fever, altered mental status, and local neurologic signs. Abscess and vasculitic occlusive strokes occur. — treatment with amphotericin B); Mucormycosis (extensive cerebral lesions); Histoplasmosis, Coccidiomycosis, and Blastomycosis (encephalopathy, meningitis, and local abscesses — treatment with amphotericin B).

**Bacterial Infections**

a. **Syphilis**

i. Syphilitic meningitis during the course of secondary syphilis, late manifestations of meningovascular syphilis (meningitis, cranial nerve abnormalities, and hydrocephalus), tabes...
dorsalis (sensory loss, ataxia, lancinating pains to the lower extremities, sphincter abnormalities), strokes, general paresis (forgetfulness, dementia, psychiatric symptoms, changes in personality, pupillary abnormalities), meningomyelitis, syphilitic polyradiculopathy, and cerebral gummata.

ii. CSF shows mononuclear pleocytosis, increased protein and IgG. Positive CSF FTA-ABS and VDRL

iii. Treatment with penicillin

b. Tuberculosis

i. Tuberculous meningitis is the most frequent neurologic manifestation (preceded by a period of 2 to 8 weeks of nonspecific symptoms, including malaise, anorexia, fatigue, fever, chills, and headache).

ii. Later signs are: worsening headache, altered mentation, seizures, and focal deficits when associated with intracerebral mass lesions tuberculomas or abscesses.

iii. Cranial nerve abnormalities can occur. Fewer than 10% of cases may develop radiculomyelitis, transverse myelitis, or anterior spinal artery syndromes.

iv. CSF of mononuclear pleocytosis, low glucose, increased protein (generally between 100 mg/dL and 200 mg/dL). CSF cultures positive (about 33%) and positive acid-fast staining to about 80% by the fourth spinal tap.

v. Treatment for 9 to 12 months with four-drug regimen (isoniazid, rifampin, pyrazinamide, and ethambutol) for first 2 months, followed by a two-drug regimen (isoniazid, rifampin) until completion of the treatment period.

V. Neurocysticercosis (cysticerci in the brain, spinal cord):

Symptoms of neurocysticercosis depend upon where and how many cysticerci (often called lesions) are found in the brain. Seizures, and headaches are the most common symptoms. However, confusion, lack of attention to people and surroundings, difficulty with balance, swelling of the brain (called hydrocephalus) may also occur. Death can occur suddenly with heavy infection

Neurocysticercosis as a possible cause of other medical conditions:

• Myositis
• Aseptic meningitis
• Intracranial space-occupying lesion
• Fits
• Intracranial calcification
• Oligoclonal bands (CSF)
• Hydrocephalus
• Raised intracranial pressure
• Dementia.

Revised Diagnostic Criteria for Neuro-cysticercosis

Absolute

• Histological demonstration of the parasite from biopsy of brain or spinal cord lesion
• Cystic lesions with scolex on CT or MRI

(173)
• Direct visualization of subretinal parasite by fundoscopy

**Major**
- Lesions highly suggestive of NCC on neuroimaging
- Positive serum EITB for detection of anti-cysticercal antibodies
- Resolution of cysts after antiparasitic therapy
- Spontaneous resolution of small single enhancing lesions

**Minor**
- Lesions compatible with NCC on neuroimaging
- Clinical manifestations suggestive of NCC
- Positive CSF-ELISA for detection of anticysticereal antibodies or cysticercal antigens
- Cysticercosis outside the CNS

**Management**

The list of treatments mentioned in various sources for Neurocysticercosis includes the following list. Always seek professional medical advice about any treatment or change in treatment plans.

- Anti-parasitic drugs
- Anti-inflammatory drugs
- Surgery
- No treatment - not all cases require treatment

The treatment modalities that can be offered to patients include (i) larvicidal agents to kill the larvae; (ii) corticosteroids to decrease or prevent inflammation; (iii) anti-epileptic drugs to prevent or decrease the severity and number of seizures; (iv) surgical-based therapies including measures to remove the cyst and shunt placement for hydrocephalus.

A panel of experts analyzed the current consensus and disagreements in the management of neurocysticercosis[24]. Their main conclusions were: (i) therapeutic decisions should be adapted to the individual and should be based on the number, location and viability of the parasites within the nervous system; (ii) growing cysticerci should be actively managed by either cysticidal drugs or surgical excision; (iii) the management of intracranial hypertension secondary to NCC should take a high priority; (iv) adequate management of seizures should be ensured.

Specially they agreed on the management of patients with moderate infections and viable cysts; calcified lesion; ventricular cysticercosis; subarachnoid cysts, including giant cysts or racemose cysticercosis and chronic meningitis; cysticercotic encephalitis (Table II).

Patients with cysticercotic encephalitis should not be treated with cysticidal drugs because this may exacerbate the intracranial hypertension observed in this form of the disease. Patients with granulomas and calcifications alone should not receive cysticidal Praziquantel and albendazole, the two antiparasitic drugs, have been reported to be effective against cysticercosis. Both the drugs effectively destroy the cerebral parenchymal cystic lesions. However, albendazole is possibly more effective in subarachnoidal, ventricular and spinal forms of cysticercosis, and frequently obviates the need for surgery drugs as these lesions represent dead parasites.
### TABLE 2: Guidelines for Treatment of Neuro-cysticercosis

<table>
<thead>
<tr>
<th>Parenchymal neurocysticercosis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Viable cysts</td>
<td>Cysticidal treatment + steroids</td>
</tr>
<tr>
<td>Calcified</td>
<td>AED; No cysticidal therapy</td>
</tr>
</tbody>
</table>

**Enhancing lesions**

<table>
<thead>
<tr>
<th>Single</th>
<th>AED; Cysticidal drugs if persistent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple</td>
<td>Anticonvulsant + cysticidal and steroids</td>
</tr>
<tr>
<td>Cysticercotic encephalitis</td>
<td>High dose steroids, Osmotic diuretic</td>
</tr>
<tr>
<td></td>
<td>No cysticidal therapy</td>
</tr>
</tbody>
</table>

**Extraparenchymal neurocysticercosis**

<table>
<thead>
<tr>
<th>Intraventricular cyst</th>
<th>Neuroendoscopic removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subarachnoid cyst</td>
<td>Cysticidal treatment + steroids</td>
</tr>
<tr>
<td>Hydrocephalus with no viable cyst</td>
<td>VP shunt if required</td>
</tr>
<tr>
<td>Spinal cysticercosis</td>
<td>VP shunt, no cysticidal treatment</td>
</tr>
<tr>
<td></td>
<td>Surgical treatment</td>
</tr>
</tbody>
</table>

### VI. Neurosyphilis

The final stage of syphilis, known as the tertiary stage is the stage that occurs in about 15 to 20% of people who have untreated syphilis. Neurosyphilis is a slow progressive, destructive infection of the brain and the spinal cord. Neurosyphilis is a progressive dementia characterized by memory problems, disorientation, mood disturbances and personality changes. Neurosyphilis has 4 different forms: asymptomatic, meningovascular, tabes dorsalis, and general paresis. Tabes dorsalis: symptoms include peripheral neuropathy, pain in the extremities, incontinence and ataxia-shakey and unsteady movements.

**General paresis signs and symptoms** include:

- Neurological symptoms include unsteady gait, incontinence, palsy, seizures, ataxia and paralisis. Neurosyphilis used to be called general paralysis of the insane, the result of a debauched and intemperate life!
- A progressive dementia characterized by memory problems, disorientation
- Mood disturbances
- Personality changes, apathy, poor judgement. About 10% to 20% of people with neurosyphilis general paresis experience psychotic symptoms that include hallucinations and paranoia.
Diagnosis of Neurosyphilis

Diagnosis of neurosyphilis is by either a test called nontreponemal antigenic test or rapid plasma reagin (RPR) test.

No test can be used alone to diagnose neurosyphilis. The VDRL-CSF is highly specific, but it is insensitive. Therefore, the diagnosis of neurosyphilis usually depends on various combinations of reactive serologic test results, abnormalities of cerebrospinal fluid (CSF) cell count or protein, or a reactive VDRL-CSF with or without clinical manifestations. Some specialists recommend performing an FTA-ABS test on CSF. The CSF FTA-ABS is less specific (i.e., yields more false-positive results) for neurosyphilis than the VDRL-CSF, but the test is highly sensitive. Therefore, some specialists believe that a negative CSF FTA-ABS test excludes neurosyphilis.

Treatment of Neurosyphilis

Tertiary syphilis is treated by intravenous penicillin. Symptoms of neurosyphilis can be reversed to a certain extent if the person with the disease responds to treatments.

Penicillin G, administered parenterally, is the preferred drug for treatment of all stages of syphilis. The preparation(s) used (i.e., benzathine, aqueous procaine, or aqueous crystalline), the dosage, and the length of treatment depend on the stage and clinical manifestations of disease.

Parenteral penicillin G is the only therapy with documented efficacy for syphilis during pregnancy. Pregnant women with syphilis in any stage who report penicillin allergy should be desensitized and treated with penicillin. Skin testing for penicillin allergy may be useful in pregnant women; such testing also is useful in other patients.

VII. Tuberculoma:

Tuberculomas are firm, avascular, spherical granulomatous masses, measuring about 2-8 cm in diameter. They are well limited from surrounding brain tissue which is compressed around the lesion and shows oedema and gliosis. The inside of these masses may contain necrotic areas composed of caseous material, occasionally thick and purulent, in which tubercle bacilli can be demonstrated. Intracranial tuberculomas can occur at any age.

In developing countries young adults and children are predominantly affected while in developed countries they are more common in older patients. The symptoms produced by tuberculoma are related to their location. Low-grade fever, headache vomiting, seizures, focal neurological deficit, and papilloedema are characteristic clinical features of supratentorial tuberculomas. Intratentorial tuberculomas are more common in children and may present with brainstem syndromes, cerebellar manifestations, and multiple cranial nerve palsy.
### Classification of CNS Tuberculosis

#### Intracranial
- tuberculous meningitis (TBM)
- TBM with miliary tuberculosis
- tuberculous encephalopathy
- tuberculous vasculopathy
- *space-occupying lesions: tuberculoma (single or multiple); multiple small tuberculoma with miliary tuberculosis; tuberculous abscess*

#### Spinal
- Pott's spine and Pott's paraplegia
- tuberculous arachnoiditis (myeloradiculopathy)
- non-osseous spinal tuberculoma
- spinal meningitis

Clinical sequelae of CNS tuberculomas are those of single or multiple intracranial mass lesions, primarily seizures and correlates of increased intracranial pressure. The features of the seizures can strongly suggest lesion location. Neuroimaging, especially MRI, is diagnostically indispensable, although biopsy remains the gold standard.

Intracranial tuberculoma without evidence of systemic TB is relatively rare and difficult to diagnose. It is often clinically quiescent for a long time, and a seizure can be an important sentinel event in such cases.

If the caseous core of a tuberculoma liquefies, a TB abscess results. These patients tend to be clinically worse overall than those with correspondingly sized tuberculoma. Again, focal seizures can be an important initial clinical manifestation.

**Management**

Of intracranial tuberculomas remain conservative and surgical intervention is restricted to limited cases. Ventriculoperitoneal shunt is carried out to prevent complications as a result of basal meningitis and hydrocephalus. Drug resistant lesions and those causing mass effect are the ones tackled surgically usually preceded by a stereotactic biopsy. However, with continued treatment, eventual resolution of these tuberculoma occurs.
NORMAL PRESSURE HYDROCEPHALUS (NPH)

Normal pressure hydrocephalus (NPH) is a brain disorder that occurs when the flow of cerebrospinal fluid (CSF) is blocked. The fluid fills up in the brain and pushes on brain tissue. The person may lose any or all brain functions controlled by the area of the brain affected.

Causes, incidence, and risk factors

Normal pressure hydrocephalus (NPH) can be a reversible or treatable disorder. It is thought to account for about 5% of all dementias. The symptoms often begin gradually.

NPH is a form of hydrocephalus, also known as “water on the brain”, which means there is too much fluid compressing the brain. It can occur without identifiable cause, or it may be caused by any condition where the flow of cerebrospinal fluid (CSF) is blocked. The CSF is produced in normal amounts in this condition, but it is prevented from being normally re-absorbed.

The ventricles (fluid-filled chambers) of the brain enlarge to accommodate the increased volume of CSF so the pressure of CSF, when measured by lumbar puncture (spinal tap), remains normal. Brain tissue is damaged or destroyed because of compression by the fluid-filled ventricles. If there is an identifiable cause and the cause can be corrected, the symptoms may reverse or at least stop getting worse. If there is no identifiable cause, the disorder is often progressive.

Symptoms

Early symptoms include:
- Changes in gait, including inability to begin walking (gait apraxia)
- Unsteady walking
- Weakness of the legs
- Sudden fall without loss of consciousness or other symptoms (drop attacks)

Symptoms of progression of the disorder:
- Dementia (loss of any or all brain functions, including movement, sensation, perception, and thought processes) — originally mild, may progress to severe dementia
- No observable mood (flat affect)
- Apathy
- Withdrawn behavior
- Impaired memory
- Difficulty maintaining attention
- Decreased spontaneity
- Urinary or bowel incontinence (loss of control over function)
- Speech impairment

Signs and tests

An examination shows gait (walking) changes related to the damage within the brain. Deep tendon reflexes may be increased in the lower legs.
- A lumbar puncture (spinal tap) may show normal pressure of CSF in the spine.
- A head CT scan or MRI of head may show changes that indicate NPH.
• A RHISA scan (a nuclear scan using radioactivity) may show changes of the circulation within the brain, or reflux of CSF into the ventricles.

Treatment

The goal of treatment is to improve symptoms. The surgical creation of a shunt that routes the CSF around the obstruction and back into the circulation is the treatment of choice.

Symptomatic treatment may vary depending on the symptoms presented and the extent that symptoms are relieved by treatment. Prognosis is poor without medical intervention. Symptoms progress and the disorder results in death.[3]

• Surgical treatment improves symptoms in about 50% of cases, with the best prognosis (probable outcome) for those with minimal symptoms. Other persons may have varying degrees of disability prior to death.[4]

IX. Subdural hematoma[5]

A subdural hematoma (also know as a subdural hemorrhage) is a buildup of blood immediately below the dura—the outermost of the three membranes that surround the brain.

Subdural hematomas occur when the veins located between the surface membrane of the brain and the dura become damaged and bleed, allowing a hematoma—a swelling filled with blood—to form. Approximately fifteen percent of occurrences of head trauma result in a subdural hematoma.

Causes of Subdural Hematomas

A subdural hematoma is most commonly caused by a severe injury to the head. In instances of acute hematomas, the blood collects quickly, putting pressure on the brain, which may, in turn, result in permanent injury or prove fatal. Chronic, as opposed to acute, subdural hematomas occur when blood accumulates gradually within the skull cavity over a period of time.

A chronic subdural hematoma is often caused by a slight and seemingly insignificant head injury. Chronic subdural hematomas sometimes exhibit symptoms similar to vascular dementia and are particularly prevalent among the elderly.

Symptoms of Subdural Hematomas

Symptoms vary according to the size and nature of the subdural hematoma and its precise location in the brain. Possible symptoms include:
  • loss of consciousness or coma
  • lethargy
  • weakness
  • delirium
  • seizures
  • headaches
  • vomiting and nausea
  • memory loss
  • difficulty concentrating
  • dizziness

(179)
• slurred speech
• altered mental, intellectual and cognitive capacity
• onset of dementia resulting from initial brain trauma.

**Treatments for Subdural Hematomas**

Speed is of the essence in the treatment of brain trauma caused by a subdural hematoma, as delay may lead to permanent brain damage.

Emergency treatment for acute subdural hematomas may involve surgery to reduce the pressure on the brain. This procedure entails an incision in the skull to allow the blood to drain. In cases where large subdural hematomas or solid blood clots have formed, major surgery may be required to remove the hematomas.

The type of medication prescribed depends on the severity of the symptoms and on the extent of brain trauma. Common medications for the treatment of a subdural hematoma include anticonvulsants to prevent seizure and diuretics to control swelling.

**Prognosis for Subdural Hematoma (Brain Trauma)**

The prognosis for chronic subdural hematomas is generally good for patients who receive early diagnosis and treatment. The outcome for acute subdural hematomas tends to be less favorable, particularly in cases of acute brain trauma.

Several factors play an important part in determining the prognosis for subdural hematomas, including:

- the type and location of the head injury
- the extent of brain trauma
- the size of the subdural hematoma
- whether the patient received emergency treatment for a subdural hematoma.

Expert opinion is divided as to whether the removal of a subdural hematoma results in patients regaining their full mental capabilities. Researchers continue their efforts to determine whether the damage caused by the persistent pressure of a subdural hematoma on the brain is treatable.

**Dementia Pugilistica**

*Dementia pugilistica* is a neurological disorder caused by repeated blows to the head, resulting in brain trauma.

Boxers, in particular, are prone to the type of sustained head trauma associated with dementia pugilistica.

Among members of the boxing profession, the onset of dementia pugilistica occurs on average at around sixteen years following initial exposure to repetitive head trauma.

The symptoms of dementia pugilistica include dementia, characterized by loss of cognitive function, and Parkinson's disease, a neurological disorder characterized by tremor and muscular rigidity.

Dementia pugilistica is also known as:

- boxer's syndrome
- chronic traumatic encephalopathy

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(180)
• punch-drunk syndrome.

X. Brain tumors:
Tumors can cause dementia symptoms in a number of ways. A tumor can press on structures such as the hypothalamus or pituitary gland, which control hormone secretion. They can also press directly on brain cells, damaging them. Treating the tumor, either medically or surgically, can reverse the symptoms in some cases. Brain tumors may produce a change in personality. For example, a person may become withdrawn, moody, and, often, inefficient at work. A person may feel drowsy, confused, and unable to think. Such symptoms are often more apparent to family members and co-workers than to the person. Depression and anxiety, especially if either develops suddenly, may be an early symptom of a brain tumor. Bizarre behavior is unusual. In older people, certain brain tumors cause symptoms that may be mistaken for those of dementia.

Meningiomas
Meningiomas are usually noncancerous but may recur after they are removed. They occur more often in women and usually appear in people aged 40 to 60, but they can begin growing in childhood or later life. They may cause weakness or numbness, seizures, an impaired sense of smell, and changes in vision. If they become very large, they may cause mental deterioration, including memory loss, much like dementia.

(D) METABOLIC DISORDERS
XI. Thyroid Disorders:

Hyperthyroidism
Attention has been directed to the possible role of stress or emotional disturbance in precipitating hyperthyroidism. Although hyperthyroidism may follow some emotional upheaval or stressful event, the possibility exists that the emotional upheaval prior to the illness may have been the by-product of the early phase of thyroid hyperactivity itself before the complete picture of the illness becomes manifested. Psychological disturbances are quite common with thyroid hyperactivity and can be part of the early picture:
• marked anxiety and tension
• emotional lability
• irritability and impatience
• distractible overactivity
• exaggerated sensitivity to noise
• fluctuating depression

More serious mental disturbances which used to accompany “thyroid crisis”, such as acute psychotic episodes, delirium and fever are rarely seen these days as a result of the improved detection of the illness and availability of effective treatment.

Management
In general, the psychological disturbances show satisfactory resolution with adequate treatment of the thyroid hyperactivity.
Hypothyroidism

Since hypothyroidism usually develops slowly, and the early complaints are frequently minor, vague and diffuse in nature, it is not surprising that the diagnosis is often overlooked. However, the physical changes that accompany the illness are characteristic: dry, rough skin; pale and puffy complexion; loss of hair; change in voice; decreased appetite, etc.

Psychological symptoms are common and well manifested by the time the patient seeks medical advice. Not infrequently, psychological disturbances are the main complaints that bring hypothyroid patients to the psychiatrist first:

- marked slowing of all mental processes
- progressive loss of initiative and interest
- memory difficulties
- thinking is easily muddled
- general intellectual deterioration
- depression with paranoid flavour
- organic psychosis

In severe, untreated cases, dementia may be the ultimate outcome. This underscores the importance of early detection and treatment.

Management

In conclusion, disturbance of thyroid function may be accompanied by psychological disturbances which can mimic other psychiatric syndromes. Hence, early detection and treatment of the thyroid disturbance, as well as appropriate attention to the emotional and psychological condition of the patient, cannot be overemphasized.

XII. VITAMIN B₁₂:

The prevalence of vitamin B-12 deficiency is difficult to ascertain because of diverse etiologies and different assays, i.e., radioassay or chemiluminescence. In India, a hospital population radioassay study with a cutoff of 200 pg/mL found a vitamin B-12 deficiency in 0.88% of patients, with borderline values in 3.8%.

The neurologic features are attributable to pathology in the peripheral and optic nerves, posterior and lateral columns of the spinal cord (subacute combined degeneration), and in the brain. Interestingly, hematologic and neurologic manifestations are occasionally dissociated. An inverse correlation in the severity of both manifestations has been suggested. In patients with neuropsychiatric abnormalities, 28% lack anemia or macrocytosis.

Although the clinical features of vitamin B-12 deficiency may consist of a classic triad of weakness, sore tongue, and paresthesias, these are not usually the chief symptoms.

In 1991, Healton et al performed detailed neurologic evaluations of 143 patients with vitamin B-12 deficiency. Seventy-four percent presented with neurologic symptoms.²⁷

Physical signs:

Most patients exhibit signs of peripheral nervous system (PNS) or spinal cord involvement, but the extent of PNS involvement remains unclear, in part because both neuropathy and myelopathy can
cause impaired vibration sense, ataxia, and paresthesias.

- Neuropsychiatric manifestations, such as recent memory loss with reduced attention span and otherwise normal cognition, depression, hypomania, paranoid psychosis with auditory or visual hallucinations (megaloblastic madness), violent behavior, personality changes, blunted affect, and emotional liability, were reported in 8% of patients.

- Cognitive testing may reveal mild impairment or frank dementia.

Lab Studies:

- **Clinical evidence of vitamin B-12 deficiency**
  - Serum cobalamin levels are the initial test.
  - Two assays exist: radioassay and the nonradioisotopic assay, chemiluminescence, which is becoming more popular because of improved automation, safety, and cost.
  - Abnormally low vitamin B-12 levels: Test for PA by measuring antibodies against IF.
  - Borderline vitamin B-12 level and clinical features of vitamin B-12 deficiency: Measure MMA and HC.
  - Schilling test: The Schilling test is used to determine the etiology of vitamin B-12 deficiency in patients with normal IF antibodies.
  - Routine hematologic and chemistry tests

**TREATMENT**

- Establish the diagnosis and etiology of vitamin B-12 deficiency and treat with adequate doses.

- The consequences of vitamin B-12 deficiency, encephalopathy, myelopathy, and peripheral and optic neuropathy require adequate medical care.

- Physical therapy and occupational therapy are needed to improve gait, balance, and arm function.
  - Patients may require canes or a walker for ambulation and safety.

- In patients with encephalopathy, neuropsychological interventions may improve cognition, social functioning, and interpersonal relationships

Standard treatment in patients with vitamin B-12 deficiency consists of parenteral or oral cobalamin. The hematologic abnormalities may respond to folate, but the neurologic manifestations only respond to cobalamin.

Numerous treatment regimens have been proposed, including cobalamin 1000 mcg IM/SC daily for 5 days followed by 1000 mcg/wk for 5 weeks, then 100-1000 mcg/mo for life.

Because 1% of cobalamin is absorbed by passive diffusion, administration of large oral doses is an alternative; 1000 mcg daily yields a daily absorption of 10 mcg, which exceeds the 2-mcg recommended daily allowance (RDA) requirement.

**XIII. Wilson’s Disease**

Wilson’s disease is an inherited disorder where there is excessive amounts of copper in the body. This causes a variety of effects, including liver disease and damage to the nervous system.

Wilson’s disease causes the body to absorb and retain excessive amounts of copper. The copper deposits in the liver, brain, kidneys, and the eyes. The deposits of copper cause tissue damage, death of the tissues, and scarring, which causes the affected organs to stop functioning properly.
Liver failure and damage to the central nervous system (brain, spinal cord) are the most predominant, and the most dangerous, effects of the disorder. If not caught and treated early, Wilson's disease is fatal.

**Symptoms:**
- enlargement of the abdomen (abdominal distention)
- splenomegaly
- yellow skin (jaundice) or eye color (icterus)
- vomiting blood
- weakness
- tremors of the arms or hands
- abnormal extremity posture (dystonia)
- movement - unpredictable and jerky uncontrollable and slow
- weakness of the head, neck, face, or arms
- speech impairment, poor enunciation
- slow or decreased facial movement/expression
- emotional or behavioral changes
- confusion or delirium
- **dementia** (loss of multiple brain functions)

**Signs and tests:**

An eye examination may show:
- Kayser-Fleischer rings (rusty or brown-colored ring around the iris).
- Eye movement may be restricted.

A physical examination may show signs of:
- Liver or spleen disorders (including cirrhosis and liver necrosis)
- Damage to the central nervous system including loss of coordination, loss of muscle control, muscle tremors, loss of cognitive and intellectual functions, loss of memory, confusion (delirium or dementia), and other damage.

Lab findings may include:
- Serum ceruloplasmin - low (although it is normal in 5% of cases)
- Serum copper - low in spite of the copper deposits in tissues
- Urine copper - high
- CBC - may show hemolytic anemia or decreased white blood cell count
- Serum uric acid levels - low

Other tests findings may include:
- Head MRI or head CT scan may be abnormal, especially in a region of the brain called the basal ganglia, but nonspecific.
- Abdominal x-ray, abdominal MRI, or CT scan of the abdomen may indicate liver disease or other abnormality.
- Liver biopsy or biopsy of the kidneys or other suspect tissue shows deposits of copper, and shows tissue changes that indicate damage to the tissues. This disease may increase the protein and amino acid level in a 24-hr. urine specimen.
Treatment:
The goals of treatment are to reduce the amount of copper in the tissues and to manage the symptoms of the disorder. Treatment must be lifelong.

The following medications may be used:
- Zinc acetate (Galzin), which blocks the absorption of copper in the intestinal tract.
- Trientine (Syprine), which binds or chelates the copper and leads to increased urinary excretion of the metal.
- Penicillamine (Cuprimine, Depen), which also binds or chelates copper and leads to increased urinary excretion.

Sometimes, medication that chelates copper, especially penicillamine, can worsen the person's neurologic function. There are other medications under investigation which will, hopefully, bind copper without risking possible worsening of neurologic function.

In addition, a low-copper diet may be recommended, including avoiding mushrooms, nuts, chocolate, dried fruit, liver, and shellfish. Distilled water may be suggested because most tap water flows through copper pipes. Avoid using copper cooking utensils.

Symptoms are treated as appropriate, including exercises or physical therapy, and protective measures for people who are confused or unable to care for themselves.

XIV. CHRONIC HEPATIC AND RENAL FAILURE:

Among metabolic and toxic disorders leading to cognitive impairment, both acute and chronic hepatic and renal failure may have adverse effects on the CNS with serious repercussions for cerebral function causing both neurological and psychiatric signs and symptoms.

They result in metabolic encephalopathies, a series of disorders that, although potentially reversible following appropriate therapy or organ transplantation, may ultimately lead to CNS changes. The best characterised of these disorders include those associated with liver and kidney failure.

Symptoms and course

Fulminant hepatic failure results from severe inflammatory or necrotic liver disease of rapid onset and progressive neurological signs from altered mental status, stupor and coma, often within hours or days. It is also seen in failed liver transplants.

Delirium and mania are encountered and, occasionally, seizures which may be multifocal before coma. No real dementia is seen.

Porto-systemic encephalopathy (PSE) is the most commonly encountered form of CNS disorder associated with hepatic failure. It accompanies the development of portal-systemic collaterals arising as a result of portal hypertension in liver cirrhosis.

Neurologically, it develops slowly, the onset is insidious starting with anxiety, restlessness, and altered sleep patterns. These symptoms are followed by shortened attention span and muscular incoordination, asterixis, and lethargy, progressing to stupor and coma.

Multiple episodes of PSE are not uncommon. In uremic encephalopathy, occurring when the glomerular filtrating rate declines below 10% of normal, neurological symptoms tend to fluctuate, and although,
variable include disturbances of memory and cognition. They may progress to delirium, convulsions, stupor and coma.

**Treatment**

Treatment would be best in a potentially reversible stage with urgent liver and/or kidney transplantation. Treatment of PSE is prevention of variceal bleeding in cirrhotic patients, use of transjugular intrahepatic portal-systemic shunts (TIPS) which are safer and less expensive to perform than portocaval anastomosis surgery. However, a major complication of TIPS is PSE, which occurs in over 30% of patients, particularly those over 60 years of age.\(^{[16]}\)

Treatment of uremic encephalopathy, except kidney transplantation, is dialysis that may be associated with various clinical disorders of the CNS: dialysis disequilibrium syndrome resulting as a consequence of an osmotic gradient which develops between plasma and the brain during rapid dialysis, progressive intellectual dysfunction, and dialysis dementia that may be related to aluminium neurotoxicity. The frequency of dialysis dementia has been reduced with the use of aluminium-free dialysate.\(^{[10]}\)

**XV. Dialysis encephalopathy syndrome**

Dialysis encephalopathy syndrome (also called dialysis dementia) occurs in patients on chronic hemodialysis. Some cases are due to toxicity from aluminum in the dialysis bath, so the incidence of the disease has decreased with the use of aluminum-free water.

**Presenting symptoms consist of:**
- dysarthria
- apraxia
- slurred speech with stuttering and hesitation

**Within months, other symptoms develop:**
- myoclonus
- asterixis
- movement dyspraxia
- seizures
- memory loss
- personality changes
- frank psychosis

Within 1 to 15 months, the disease usually progresses to apneic spells and death from sepsis or suicide. In some patients, however, the disease is transient, and others have a variable course lasting several years.

The EEG shows changes similar to those in aluminum encephalopathy syndrome. The bursts of sharp and slow activity and clinical symptoms sometimes are suppressed by oral or intravenous diazepam early in the disease.\(^{[36]}\) Seizures can be distinguished from nonepileptic movements by combined EEG recordings and electromyography (EMG).

Symptoms similar to dialysis dementia can be caused by acute hypercalcemia and severe hypophosphatemia, which can occur during hemodialysis.

Drug-resistant seizures can be associated with the removal of pyridoxine during hemodialysis.

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\(^{[10]}\)
Management
Aluminum-containing phosphate binders and infant formulas should be stopped. Aluminum chelation with deferoxamine may lead to dramatic improvement, even in advanced cases.
Control of secondary hypoparathyroidism, iron deficiency anemia, and hyperphosphatemia will reduce aluminum absorption by the gastrointestinal tract. The concentration of aluminum in the dialysate should be monitored periodically.
Pyridoxine supplementation must be given when pyridoxine deficiency is present.
Benzodiazepines such as clonazepam and diazepam are effective in controlling the myoclonus. Benzodiazepines may temporarily control the bursts of sharp and slow activity on the EEG and may temporarily reduce the clinical symptoms of the syndrome.\textsuperscript{[56]}
Phenytoin usually is used for tonic-clonic seizures because relatively little is removed by hemodialysis and it can be given intravenously in loading doses to maintain a desired plasma concentration.

XVI. Hypocalcemia
Calcium homeostasis is maintained by vitamin D and parathyroid hormone (PTH), and the major causes of hypocalcemia are vitamin D deficiency and hypoparathyroidism.
Symptomatic hypocalcemia is usually defined as an abnormal reduction in the serum ionized calcium concentration, or as a serum calcium level less than 7.5 mg/dL in the presence of normal levels of serum proteins. (The total serum calcium concentration is reduced approximately 0.8 mg/dL for every 1 g/dL reduction in serum albumin concentration.)\textsuperscript{[56]}

Clinical presentation
The symptoms of hypocalcemia generally reflect the degree of hypocalcemia and the acuteness of the fall in serum ionized calcium concentration. Even slowly developing hypocalcemia may produce an encephalopathy, dementia, depression, or psychosis, however.
Acute hypocalcemia primarily causes neurologic symptoms because of increased neuromuscular excitability. Symptoms include:
* numbness and tingling of the fingers, toes, and circumoral region
* muscle cramping, stiffness
* carpopedal spasm, tetany (flexor spasms in the arms and extensor spasms in the legs)
* laryngeal stridor
* tremor and chorea (may be misdiagnosed as seizures)
* seizures

Evaluation
The examination shows mental status changes, including irritability, depression, and psychosis. Papilledema may be present, as may Trousseau’s and Chvostek’s signs.
The diagnosis of hypocalcemia should be confirmed by repeated measurement of serum calcium. If the diagnosis of hypocalcemia is uncertain (e.g., if the patient has hypoalbuminemia), serum ionized calcium should be measured for verification.
Other laboratory tests that may establish the underlying cause in selected patients are:

- creatinine
- amylase
- magnesium
- phosphate
- PTH
- calcidiol
- calcitriol

Treatment

Patients with symptomatic hypocalcemia should be treated immediately because of the high associated morbidity and mortality. Intravenous calcium is the most appropriate treatment, unless severe hypomagnesemia is present. Ten to 20 mL of 10% calcium gluconate (containing 10 mg of elemental calcium per mL) should be administered over 10 to 20 minutes.

An infusion raises the serum calcium concentration for up to 3 hours, so additional slow infusions of calcium are usually necessary. The dose should be 0.5-1.5 mg/kg per hour. Either 10% calcium gluconate (90 mg of elemental calcium per 10-mL ampule) or 10% calcium chloride (360 mg per 10-mL ampule) can be used. Intravenous calcium should be continued until the patient is able to take an effective regimen of oral calcium and vitamin D. Calcitriol, in a dose of 0.25-0.50 mg per day, is the preferred preparation of vitamin D for patients with severe acute hypocalcemia, because of its rapid onset of action. Patients with hypoparathyroidism require chronic vitamin D and calcium therapy.

XVII Hypercalcemia

Hypercalcemia is defined as an excessive amount of calcium in the blood.

Hypercalcemia symptom

Symptoms of hypercalcemia can influence many organs and tissues of the body. For instance, in the skeletal system, hypercalcemia can lead to bone pain, spinal column curvature, and pathological fractures. Abnormal symptoms of hypercalcemia include nausea, vomiting, and constipation. Psychological symptoms of hypercalcemia could include depression, irritability, apathy, and dementia. In the musculoskeletal system, hypercalcemia can lead to the symptoms of weakness, muscle twitches, and muscle atrophy. Kidneys can be damaged and lead to frequent urination.

Hypercalcemia Cause

The two most common causes of hypercalcemia are primary hyperparathyroidism and cancer. Primary hyperparathyroidism is the most common cause of hypercalcemia and is due to excess lifetime production of parathyroid hormone (PTH). Parathyroidectomy is the only curative intervention for primary hyperparathyroidism. Another cause of hypercalcemia is multiple myeloma.

Hypercalcemia Treatment

In the rare cases of patients with primary hyperparathyroidism who present with clinical symptoms due to their hypercalcemia, pharmacological treatment may be required. Fluid repletion and intravenous (IV) administration of bisphosphonates are recommended in the...
(E) PSYCHIATRIC DISORDERS

XVIII. Pseudodementia (Depression)

Depression is perhaps the most common cause of "reversible" dementia in the geriatric population. Unlike younger individuals, elderly depressed patients may present with cognitive impairment, i.e., confusion, memory disturbance, attention deficits, all of which can be mistaken for dementia. Depression may also coexist with dementia and worsen the problem. Depressive pseudodementia may be difficult to distinguish from dementia. Some older depressed patients don't report depressed mood.

- **Pseudodementia: Approach**
  - Maintain high index of suspicion in cognitively impaired patients
  - Look for vegetative symptoms (appetite/sleep changes, psychomotor retardation/agitation, anhedonia)
  - Therapeutic trial of antidepressant for questionable cases
  - Screen all patient for depression initially and then every sixth months using validated screening questionnaire such as cornell scale for depression in dementia.

<table>
<thead>
<tr>
<th>Features Distinguishing Dementia and Depressive Pseudodementia:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precise onset</td>
</tr>
<tr>
<td>Duration</td>
</tr>
<tr>
<td>Complaints of cognitive loss</td>
</tr>
<tr>
<td>Hx of psych illness</td>
</tr>
<tr>
<td>&quot;Don't know&quot; answers</td>
</tr>
<tr>
<td>Affect</td>
</tr>
</tbody>
</table>

**Table - Cornell scale for depression in dementia**

Use this measurement scale to document depressive signs and symptoms in patients with dementia that are reported by the care giver or family member. Ratings should be based on symptoms and signs occurring during the week prior to interview. No score should be given if symptoms result from physical disability or illness. Scoring System: a = unable to evaluate 0 = absent 1 = mild or intermittent 2 = severe

(189)
<table>
<thead>
<tr>
<th>Mood-Related Signs</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Anxiety (anxious expression, ruminations, worrying)</td>
<td>a012</td>
</tr>
<tr>
<td>2. Sadness (sad expression, sad voice, tearfulness)</td>
<td>a012</td>
</tr>
<tr>
<td>3. Lack of reactivity to pleasant events</td>
<td>a012</td>
</tr>
<tr>
<td>4. Irritability (easily annoyed, short tempered)</td>
<td>a012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Behavioral Disturbance</th>
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</tr>
</thead>
<tbody>
<tr>
<td>5. Agitation (restless, hand wringing, hair pulling)</td>
<td>a012</td>
</tr>
<tr>
<td>6. Retardation (slow movements, slow speech, slow reactions)</td>
<td>a012</td>
</tr>
<tr>
<td>7. Multiple physical complaints (score 0 if GI symptoms only)</td>
<td>a012</td>
</tr>
<tr>
<td>8. Loss of interest (less involved in usual activities -- score only if change occurred acutely, i.e., in less than 1 month)</td>
<td>a012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical Signs</th>
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</thead>
<tbody>
<tr>
<td>9. Appetite loss (eating less than usual)</td>
<td>a012</td>
</tr>
<tr>
<td>10. Weight loss (score 2 if greater then 5 lbs. in 1 month)</td>
<td>a012</td>
</tr>
<tr>
<td>11. Lack of energy (fatigues easily, unable to sustain activities -- score only if acute change in less than 1 month)</td>
<td>a012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cyclic Functions</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>12. Diurnal variation of mood (symptoms worse in the morning)</td>
<td>a012</td>
</tr>
<tr>
<td>13. Difficulty falling asleep (later than usual for this individual)</td>
<td>a012</td>
</tr>
<tr>
<td>14. Multiple awakens during sleep</td>
<td>a012</td>
</tr>
<tr>
<td>15. Early morning awakenings (earlier than usual for person)</td>
<td>a012</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ideational Disturbance</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>16. Suicide (feels life is not worth living, has suicidal wishes, or makes suicide attempt)</td>
<td>a012</td>
</tr>
<tr>
<td>17. Self-deprecation (self-blame, poor self esteem, or feelings of failure)</td>
<td>a012</td>
</tr>
<tr>
<td>18. Pessimism (anticipation of the worst)</td>
<td>a012</td>
</tr>
<tr>
<td>19. Mood congruent delusions (delusions of poverty, illness, or loss)</td>
<td>a012</td>
</tr>
</tbody>
</table>

Total Score

(190)
Score > 7 probable depression

Treatment: As with most forms of depression, antidepressants work well. ECT often provides relief if the drugs fail and the case is severe; however, shock therapy often causes brief memory loss, thereby worsening the symptom you’re trying to alleviate.

XIX. SLEEP APNEA SYNDROME

There are three types of sleep apnea, central sleep apnea (CSA), obstructive sleep apnea (OSA), and mixed sleep apnea (both central sleep apnea and obstructive sleep apnea). It can lead to excessive daytime sleepiness, decreased intellectual functioning, decreased sexual functioning, memory loss and depression. This in turn, can lead to loss of employment, marriage break-up and is associated with some permanent memory loss and dementia. It is responsible for car accidents and industrial accidents, and is linked to the development of hypertension. Lack of oxygen at night can also place the heart under strain and lead to other health problems. Untreated sleep apnea can cause premature death from heart attack and strokes. It is also associated with the development of increased blood pressure and, in the elderly, worsened dementia.

TREATMENT:

Sleep apnea responds well to treatment. Specific sleep apnea characteristics determine which treatment will work best for you. Treatments include:

- Behavioral treatments for sleep apnea (self-help)
- Physical or mechanical therapy or treatment for sleep apnea, including surgery

Medication is not usually an effective treatment for sleep apnea.

The specific therapy for sleep apnea is tailored to the individual patient based on medical history, physical examination, and the results of polysomnography.

Behavioral Therapy

Behavioral changes are an important part of the treatment program, and in mild cases behavioral therapy may be all that is needed. The individual should avoid the use of alcohol, tobacco, and sleeping pills, which make the airway more likely to collapse during sleep and prolong the apneic periods. Overweight persons can benefit from losing weight. Even a 10 percent weight loss can reduce the number of apneic events for most patients. In some patients with mild sleep apnea, breathing pauses occur only when they sleep on their backs. In such cases, using pillows and other devices that help them sleep in a side position is often helpful.

Physical or Mechanical Therapy

Nasal continuous positive airway pressure (CPAP) is the most common effective treatment for sleep apnea. In this procedure, the patient wears a mask over the nose during sleep, and pressure from an air blower forces air through the nasal passages. The air pressure is adjusted so that it is just enough to prevent the throat from collapsing during sleep. The pressure is constant and continuous. Nasal CPAP prevents airway closure while in use, but apnea episodes return when CPAP is stopped or used improperly.

Dental appliances that reposition the lower jaw and the tongue have been helpful to some patients.
with mild sleep apnea or who snore but do not have apnea. Possible side effects include damage to
teeth, soft tissues, and the jaw joint. A dentist or orthodontist is often the one to fit the patient with
such a device.

Surgery

Some patients with sleep apnea may need surgery. Although several surgical procedures are used to
increase the size of the airway, none of them is completely successful or without risks. More than one
procedure may need to be tried before the patient realizes any benefits.

Some of the more common procedures include removal of adenoids and tonsils (especially in children),
nasal polyps or other growths, or other tissue in the airway and correction of structural deformities.
Younger patients seem to benefit from these surgical procedures more than older patients.

XX. Chemotherapy and Radiation therapy induced dementia

Chemobrain and chemofog these terms refer to cognitive changes during and after cancer diagnosis
and treatment. Women with breast cancer who underwent adjuvant chemotherapy were the first
group to bring these symptoms to light, as more started mentioning their symptoms to their doctors.
It isn’t clear whether chemotherapy, or other factors such as stress and hormonal fluctuations, cause
the changes in memory and thinking.

In general, researchers have found that chemotherapy affects cognitive abilities in the following
manner:

- Word finding.
- Memory.
- Multitasking.
- Learning.
- Processing speed.

A number of factors can cause temporary memory problems in people undergoing chemotherapy —
making it difficult to decipher the so-called chemobrain from the normal stresses of treatment.
Temporary memory problems can, for the most part, be treated. Causes include:

- Low blood counts. If your blood counts are low, you might feel tired, making it difficult to concentrate.
- Stress. Being diagnosed with cancer and starting treatment is stressful. Stress also makes
  concentrating difficult.
- Medication to treat side effects. Certain medications for treating side effects such as nausea and
  vomiting may cause drowsiness. When you’re tired, it may take longer to complete tasks.
- Lingering depression. Depression is common in people with cancer. If your depression continues
  after your treatment, you might find it difficult to pay attention.
- Lingering fatigue. Fatigue is a side effect of several types of cancer treatment, including
  chemotherapy. Your fatigue might end when your cancer treatment ends, though it also can
  continue after treatment.
- Hormonal changes. Many cancer treatments may alter the normal hormonal balance in your
  body, causing cognitive changes. Hormonal changes are a side effect of some treatments and,
  with other treatments, are the intended way to treat your cancer.

About 20 percent to 30 percent of people undergoing cancer treatment will experience cognitive
improvement, though some studies report that at least half the participants had memory problems. Signs and symptoms of these memory changes last for at least a year or two after your treatment. The changes can continue for several years or they can go away sooner.

Cancer patients diagnosed with chemotherapy-related fatigue and cognitive impairment ("chemobrain") were treated with the central nervous system stimulant dexamethasphenidate for eight weeks. Compared to those receiving a placebo, patients taking the drug experienced significantly less fatigue and possibly better memory function.

Radiation to the brain can impair memory and motor function, as well as ability to learn new things and to multitask. Older adults and people receiving high doses of radiation are at a greater risk of memory problems. If patients receive both chemotherapy and brain radiation, risk is also higher.

Management of Behavioral Symptoms Associated with Dementia

Demented patients may behave unpredictably. Typical modes are: anxious, aggressive, repetitive questions or gestures. Often these behaviors occur in combination, making it difficult to distinguish one from another.

Behavioral problems may appear slowly and change as dementia progresses. The most common problematic behaviors are: agitation; aggression and combativeness; suspiciousness/paranoia; delusions; hallucinations; insomnia; and wandering.

Approach

1. First evaluate your patient for potential underlying medical causes.

2. Behavioral symptoms may result from the following, but often the patient is unable to communicate their problems: physical discomfort; medication side effects; chronic pain; infection; nutritional deficiencies; dehydration; impaired vision or hearing. These may respond to non-drug treatment.

Non-Drug Treatment

1. We recommend non-drug treatments as a first-line approach such as modifying the environment (lighting, color, and noise). Dim lighting, for example, makes some individuals uneasy, while loud or erratic noise often causes confusion and frustration. Also it may help to keep familiar personal possessions visible.

2. Planning activities. Planned activities help patients feel independent and needed by focusing their attention on pleasurable or useful tasks. Daily routines such as bathing, dressing, cooking, cleaning, and laundry can be turned into productive activities. Other more creative leisure activities can include singing, playing a musical instrument, painting, walking, playing with a pet, or reading. Planned activities may relieve depression, agitation, and wandering.

Drug Treatment

1. Antipsychotics (neuroleptics) such as Haloperidol, Olanzapine Quetiapine, Risperidone, or the Phenothiazines.

2. Anxiolytics such as Alprazolam, Buspirone, Diazepam, Lorazepam.

3. Antidepressants such as Amitriptyline, Bupropion, Desipramine, Fluoxetine, Fluvoxamine, Nefazodone, Nortriptyline, Paroxetine, Sertraline, Trazodone.
REFERENCES


45. Pfeffer RI, Kurosaki TT, Harrah CH Jr, Chance JM, Filos S. Measurement of functional activities


59. Weytingh MD, Bossuyt PM, van Crevel H. Reversible dementia: more than 10% or less than 1%? A quantitative review. J Neurol. 1995; 242: 466-71.