The Chinese University of Hong Kong
The Nethersole School of Nursing
CADENZA Training Programme

CTP 004 – Dementia: Preventive and Supportive Care

Web-based Course for
Professional Social and Health Care Workers

香港賽馬會慈善信託基金
The Hong Kong Jockey Club Charities Trust

Chapter 1

Overview on Dementia: definition, types, staging and diagnosis

Outline

- Definition of Dementia
- Prevalence
- Types of dementia
  - Pathology
  - Diagnostic criteria
  - Clinical features
  - Risk factors
  - Course
- Diagnosis of dementia

What is dementia?

World Health Organization (WHO) (2001) definition:

- *'the acquired global impairment of cognition which has significant effects on occupational, social and functional ability'*
- Components of Cognition:
  - Memory and learning
  - Attention, concentration and orientation
  - Thinking (e.g. problem solving, abstraction)
  - Calculation
  - Language (e.g. comprehension, word finding)
  - Geographic orientation
- A syndrome caused by a range of (>55) illnesses (Geldmacher & Whitehose, 1996)

Dementia vs mild cognitive impairment (MCI)?

MCI

- has impairments limited to one category of cognitive function
- e.g. memory, judgment, reasoning, executive function
- does not interfere with his or her activities of daily living

Dementia

- has impairment in two or more cognitive functions
- such impairment interferes with the person's ability to function in his usual manner in his social, family, personal or professional life.

http://www.preventad.com/memorybrain_mcidementia.html

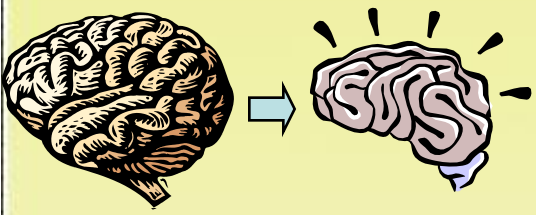
Prevalence

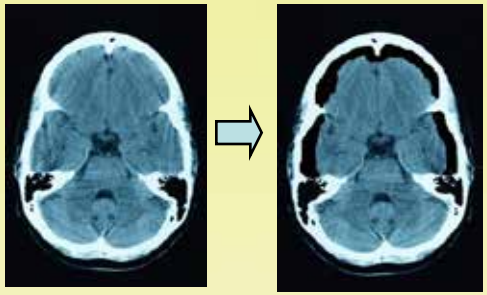
- 3.9% for age ≥ 60 (Ferri et al., 2005)
- Highest prevalence in
  - China (5 million)
  - European Union (5 milion)
  - USA (2.9 milion)
- Prevalence increase with
  - Age
    - Prevalence doubles with every five years of age (Qiu et al., 2007)
  - Female > Male

    (National Collaborating Centre for Mental Health, 2007)
- Hong Kong prevalence
  - One out of ten old people (Age >65) suffered from dementia (CUHK and Department of Health, 2004)

Major groupings for Dementia

Alzheimer's dementia	Vascular dementia	Dementia with Lewy bodies	Frontotemporal dementia
Main features: Memory loss Brain Shrinkage	Main features: Focal sign Cerebrovascular disease	Main features: Mental impairment with motor features of parkinsonism	Main features: Behavioral symptoms Atrophy of Frontal & Temporal lobe





- Clinical features are different
- ***Co-existence*** of different types of dementia is possible e.g. Alzheimer's + Vascular dementia

Alzheimer's disease (AD)

First described by Alois Alzheimer in 1907

- Discover neurofibrillary tangles in a demented patient who was in her 50s

Epidemiology

- Accounts for 50-70% of all cases of dementia
- Female > Male (National Collaborating Centre for Mental Health, 2007)
- Every 72 seconds, someone in America develops Alzheimer's disease
- AD account for 65% of all dementia patient aged >70 in Hong Kong (Chiu et al., 2002)

Please click here!

Auguste D
the first person diagnosed with Alzheimer's disease.

Pathology

- Insoluble amyloid plaques and neurofibrillary tangles deposited throughout the cerebral cortex
  - contribute to the degradation of the neurons (nerve cells) in the brain (causing cell death)
- Cerebral Atrophy
  - Striking loss of synapses and neurons

Pathology

- Excess Aβ peptides (which form amyloid plaques)
  - Amyloid precursor protein (APP) gene mutation (chromosome 21)
  - Usually find in early onset of AD
- Apolipoprotein E4 (apoE4)
  - apoE4 gene (chromosome 19)
  - Risk factor for late-onset AD (Schmechel et al., 1993)
  - Bind amyloid into plaques

Diagnostic criteria (NINDS-ADRDA*)

- Definite AD
  - Histopathologic evidence of AD via autopsy or biopsy; and
  - Meets the criteria for probable AD (as follow)
- Probable AD
  - Confirmed by clinical and neuropsychological examination
    - progressive deficits in two or more areas of cognition, including memory;
    - onset between the ages of 40-90 years; and
    - absence of systemic or other brain diseases capable of producing a dementia syndrome, including delirium

*National Institute of Neurological and Communicative Disorders and Stroke-Alzheimer's Disease and Related Disorder Association

Diagnostic criteria (DSM-IV-TR*)

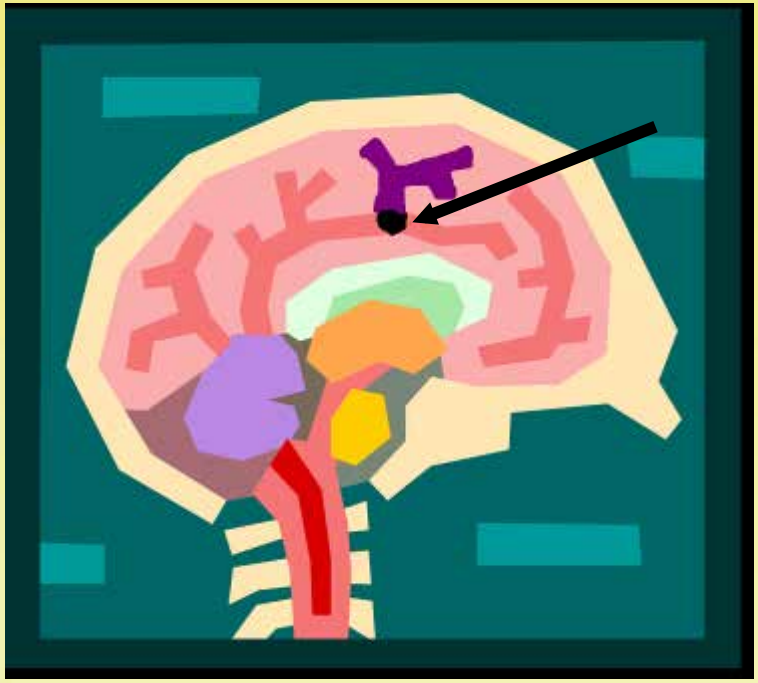
- Probable AD
  - Presence of a memory disorder
  - Impairment in at least one additional cognitive domain
    - Aphasia (language disturbance)
    - Apraxia (impaired ability to carry out motor activities)
    - Agnosia (failure to recognize objects)
    - Executive functioning (planning, organizing, sequencing, etc.)
  - *Both of the above interfere with social function or activities of daily living (ADL)*

(American Psychiatric Association, 2000)

* Diagnostic and Statistical Manual of Mental Disorders, fourth edition – text revised

Risk factors

- Age
- Genetic factors
- Down's syndrome
  - Alzheimer change in 40s
- Head trauma
  - Loss of consciousness ð **Double** the chance of developing AD!! (Gentleman and Roberts, 1991; Mortimer et al., 1991)
- Other medical risk factors
  - Depression
  - Diabetes mellitus (DM)
  - Aluminum toxicity
  - Hypothyroidism
- Education and lifestyle
  - Higher education may delay the onset of symptoms by up to 5 years
    - Controversial findings in such protective effect
  - Participation more in various activities è Less likely to develop AD



Vascular dementia

Vascular dementia (VaD)

- Epidemiology
  - Second most common cause of dementia
    - Account for 15-20% of all dementia cases
- Men>Women (Leys et al., 1998; Micieli, 2006)
  - May be related to high prevalence of cerebrovascular accident in male objects
- Account for around 29% of dementia patient aged >70 (Chiu et al., 2002)

Pathology

- **Interruption of adequate blood supply to brain tissue**
  1. Multi-infarct dementia
  2. Strategic single infarct dementia
  3. Small vessel disease
  4. Hypoperfusion
  5. Haemorrhagic dementia
  6. Other mechanisms (combinations of 1-5 and unknown mechanisms)
- **Dementia as a complication of stroke**
  - Early onset within three months
  - Latest onset up to 1-4 years after stroke
- **Likelihood of developing dementia varies with the type, location and severity of the infarct**

Diagnostic criteria (NINDS-AIREN*)

- Abrupt onset or fluctuation stepwise progression of dementia, with antecedent cererbrovascular disease (CVD) within 3 month
- Criteria for dementia
  - Memory impairment
  - Impairment of 2 or more cognitive domains
- Criteria for CVD
  - Focal signs on neurological exam
  - Radiographic evidences

*National Institute of Neurological Disorders and Stroke & the Association Internationale pour la Recherche et l'Enseignement en Neurosciences

Clinical features

- Onset is often abrupt
- Focal neurological sign
- Patchy cognitive deficits
  - Retain personality, insight and the capacity for judgment
  - Nighttime confusion (Arvanitakis, 2000)
- Neuropsychiatric symptoms
  - Apathy, depression, emotional lability and delusions

(Onyike, 2006).

Risk factors

Hypertension
Coronary artery disease
Diabetes mellitus
Hyperlipidemia
Hyperglycemia
Smoking

AGE (well established risk factor)
Genetic predisposition
Prior strokes

Dementia with Lewy bodies

Dementia with Lewy bodies (DLB)

- Epidemiology
  - 10-15% of diagnosed dementias
  - Male>Female
  - Age of onset: 50-80

(Cercy and Bylsma, 1997)

Pathology of DLB

- **Presence of cytoplasmic inclusions – Lewy bodies (LB)**
  - Unknown cause
  - Possible mechanism: occurs by accumulation of protein, α-Synuclein in axon as well as cell body of neuron
- **Two types of LB**
  - Classical
    - Found mainly in subcortical region of brain
  - Cortical
    - Diffuse throughout the cerebral cortex

Pathology of DLB

- **Localization and density of LB are associated with the severity of clinical syndromes**
  - Cerebral cortex – e.g. affect cognition
  - Brain stem – e.g. motor functions
  - Temporal lobe – e.g. visual hallucination
- **LB may interrupt the transport of protein within neuron**
  - Lead to neuronal degeneration

(Duda, 2004)

Diagnostic criteria

(1)Progressive cognitive decline with interference on normal social/ occupational function

Any two of the following symptoms:

- Spontaneous motor features of Parkinsonism
- Recurrent visual hallucinations
- Fluctuating in cognitive function

Other supportive features:

- Repeated falls
- Synope
- Transient loss of consciousness
- Neuroleptic sensitivity
- Systematized delusion
- Hallucinations in other modalities

60% DLB patients exhibit all three core features

40% present only two core features

(McKeith et al., 1996)

Risk factors

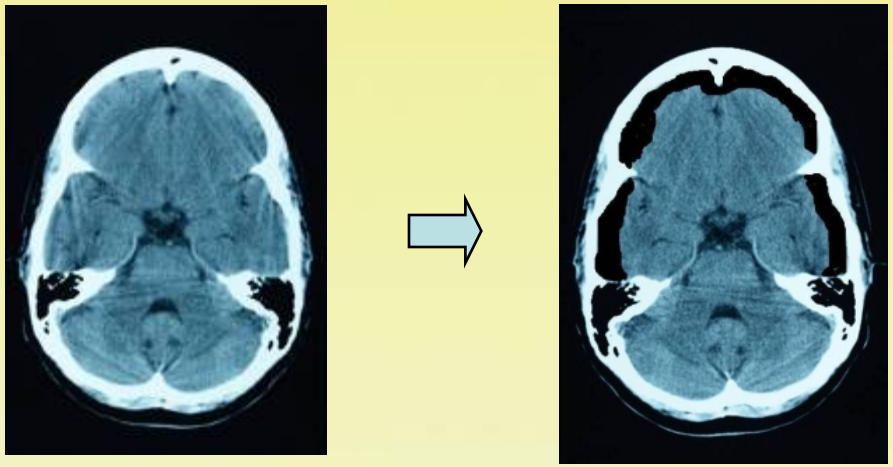
- é Age
- Male
- Family history and genetics
- Smoking
- Early occurrence of visual hallucinations or confusion
- Depression

(Emre, 2003)

Disease course

- Lifespan of 5-7 years
- Not follow a pattern of stages
- Rate of decline
  - Some studies showed rapid decline in cognitive function and shorter survival duration (Olichney et al., 1998; McKeith et al., 1992; Walker et al., 2000)
  - Other showed similar progress in cognitive dysfunction as AD (Ballard et al., 2001; Helmes et al., 2003)

Frontotemporal Dementia



Frontotemporal dementia (FTD)

First recognized as Pick's disease (frontal lobar degeneration) 1892

- Epidemiology (Bird et al., 2003; Snowden et al., 2002)
- Accounts for 5-10% of all dementia cases aged > 65 years old
- Male = Female

Diagnostic criteria

1. Gradual, early and progressive decline in behavioral or cognitive function cause significant impairment in social or occupational function, manifested by either
   - change in personality: difficulty in modulating behavior è inappropriate responses or activities
   - change in language: problems with language expression, naming and word meaning difficulties

(Mckhann et al., 2001)

Diagnostic criteria

2. The above deficits are
   - not due to other nervous system conditions (e.g., CVD), systemic conditions (e.g., hypothyroidism), or substance-induced conditions.
   - not occurring exclusively during a delirium.
   - not accounted for by a psychiatric diagnosis (e.g., depression).

(Mckhann et al., 2001)

Clinical features

- Frontal lobe syndrome:
  - Deficit in executive functions
  - Early change in social and personal conduct
  - Emotional blunting, apathy
  - Lack of insight
  - Disinhibition result in impulsive, inappropriate or compulsive behavior
  - Hyperorality
  - Visuospatial skills preserved
  - Usually oriented to time and place

- Temporal lobe syndrome:
  - Language deficit
    - Echo like spontaneous repetition of words or phrases (echolalia)
    - Reduction in speech verbal stereotypies, late mutism
    - Word findings difficulties

Risk factors

Yet to be identified

n Genetic factor

- Autosomal dominant gene (chromosome 17)
  - Tau: protein that are abundant in central nervous system
  - Promote microtubules (structural component in cell which involved in many cellular processes) assembly
  - Mutations lead to tau dysfunction - neurodegeneration

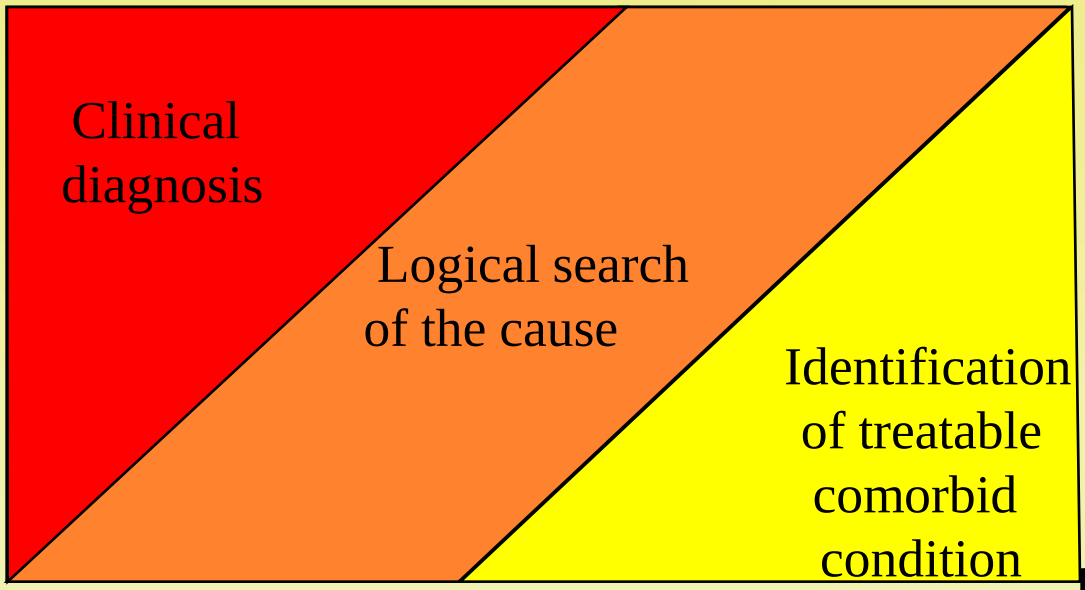
(Forman et al., 2004; Spillantini et al., 2000)

Disease course

- Follow time course similar to AD
- Age of onset: mid 50s
- Gradual and progressive change
- Duration of illness: 2-20 years

Diagnosis of dementia

Diagnosis for dementia



Steps of diagnosis

- Patient History
- Family Interview
- Structural imaging
- Basic LABoratory tests
- Physical examination
- Cognitive tests

HIS LAB-PC

Patient History

- Progress of illness
- Risk factors
  - Vascular like DM, HT
  - Family history
  - Head trauma
  - Smoking/alcohol
  - Education level
- Event of stroke? Parkinsonism?

Family Interview

- Separate history taken from caregiver/family member
- Especially those fail to be noticed or reported by patient
  - Functional impairment
  - "Embarrassing behaviour"
- Assess the need of family and social support

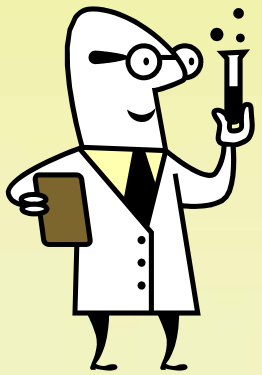
Structural imaging

- Computed Tomography (CT)
- Magnetic Resonance Imaging (MRI)
- Functional neuroimaging
  - Functional MRI
  - Single photon emission CT
  - Magnetic resonance spectroscopy
  - Positron Emission Tomography (PET)

LABoratory test

Exclude systematic diagnoses which associated with cognitive impairment

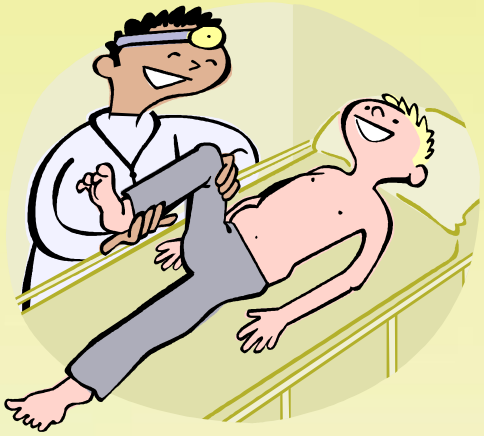
- Blood test
  - Complete blood count
  - Thyroid stimulating hormone
  - Serum calcium, electrolytes and fasting blood glucose
  - Folate level
- ECG
- Chest X-ray



Physical Examination

Physical signs

- Gait
- Vision and eye movement
- Motor function
  - Facial asymmetry
  - Speech
  - Muscle tone
- Neurological examination
  - Stroke
  - Parkinsonism

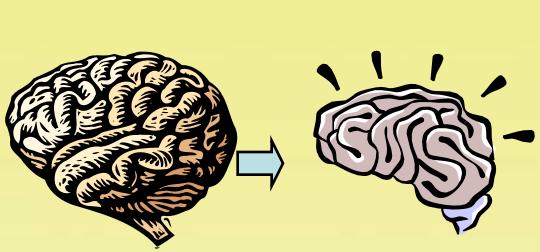


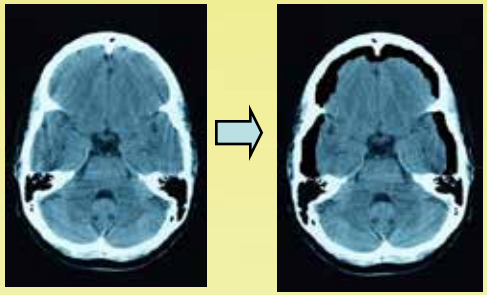
Cognitive test

- Brief cognitive test
  - Presence and severity of memory and cognitive deficits
  - Communication across health disciplines
    - E.g. Mini-Mental State Examination (MMSE)
    - Clock drawing test
- Neuropsychological and psychiatric assessment

Conclusion

- Dementia can be divided into 4 main types:



- Diagnose using HIS LAB-PC!!

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