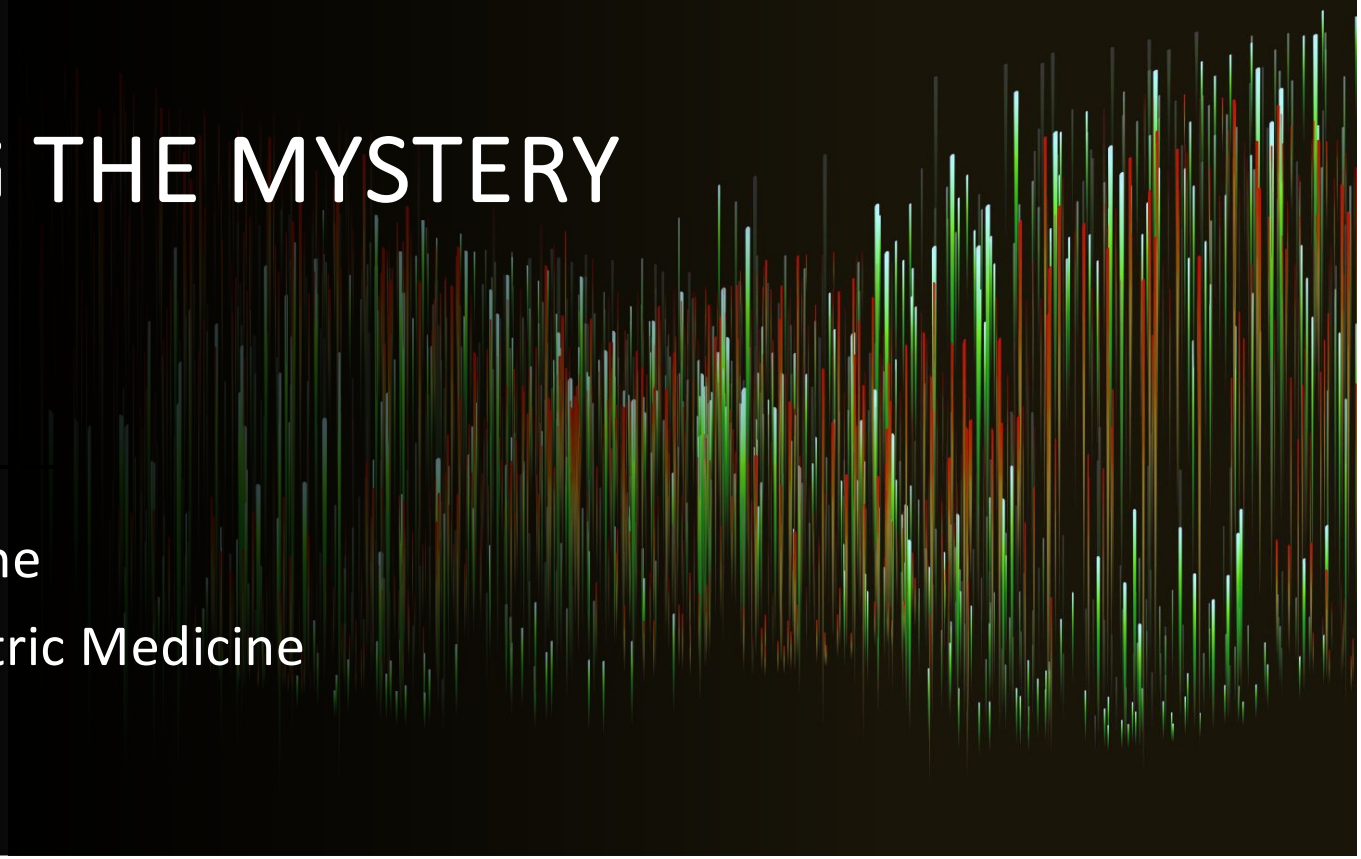
RECURRENT FALLS:

UNRAVELLING THE MYSTERY



Praveenee Wickramaratne

Senior Registrar in Geriatric Medicine

Patient details

Mrs. H.R

70y

Mother of 2 grown children – living abroad
Widow (Husband passed away 10 years back)

Former manager in a company abroad
Now residing in Athurugiriya Sri Lanka

Background

- HTN
- Dyslipidaemia
- Hypothyroidism
- Parkinson’s disease

- Fever with chills and rigors for 3 days Dysuria and lower abdominal pain
  No flank pain, haematuria or reduction in urine output

- Altered behaviour with restlessness and aggression 2 days
  Fluctuating through out the day
  Attention impairment

  Altered sleep pattern for 2 days

- Reduced appetite

- No h/o headache, photophobia

FALL

- patient presented with a fall while mobilizing from bathroom back to her bed in the morning.
- Few minor injuries without any head injury.
- No history of chest pain, palpitations or dizziness.
- No history of head injury, Loss of consciousness, seizure activity, limb weakness or long lie.
- No undue pain suggestive of fractures.
- Patient's family had helped her back to bed.

- However, patient has a history of recurrent falls.

  2 in the last 6 months (few episodes of near falls)

- Furthermore, Mrs. HR has a progressive gait impairment for 8 years which was initially noticed as slowness of gait.

- She was diagnosed with Parkinson's disease by a Neurologist during this period without rigidity or tremor and initiated on levodopa- carbidopa therapy but with no improvement.

- However, Mrs. HR has noticed worsening gait impairment over the years, after which she reluctantly stopped her daily walks.

- Gradually needing walking aids for mobilization.

- At home she mobilizes with the help of family and when outdoors she uses a walking aid.

- Progressive Cognitive impairment over 6 years

  Initially noticed of short term memory impairment -> Episodic memory impairment

- Financial error in her Job – 3 years back -> Resigned

- Denies hallucinations .

- Gradually affected IADLs and ADLs . Now not involved in any IADLs

  now needing Support for transferring, mobilising bathing and dressings (need cueing).

  Participation in family and social events were significantly affected.

- No history of Head trauma, Meningitis, Seizures, Stroke

- 6 month history of urgency and urge incontinence which was mainly attributed to functional incontinence (gait problem).

- For 2 months she had been on incontinence products.

- Normal bowel habits. No recurrent UTIs

- lump at vulva which was not evaluated

- No history of limb weakness/ cough, sob/GI symptoms.
- No h/o head trauma / seizures
- No h/o meningitis

Time line

8	6	3	1	0.5 years
1st noticed slowness of gait	Cognitive impairment	Loss of employment	Falls	Urge incontinence Increased dependency

CGA

- No low mood, pessimistic thoughts / guilt about the past suggesting depression
- No LOW, LOA
- Consumes average Sri Lankan diet with adequate calorie Non vegetarian diet
  Good dentition

  No dysphagia
- Mini nutrition scale- 10 at risk of malnutrition
- No reported easy fatiguability.

- **PMHx**

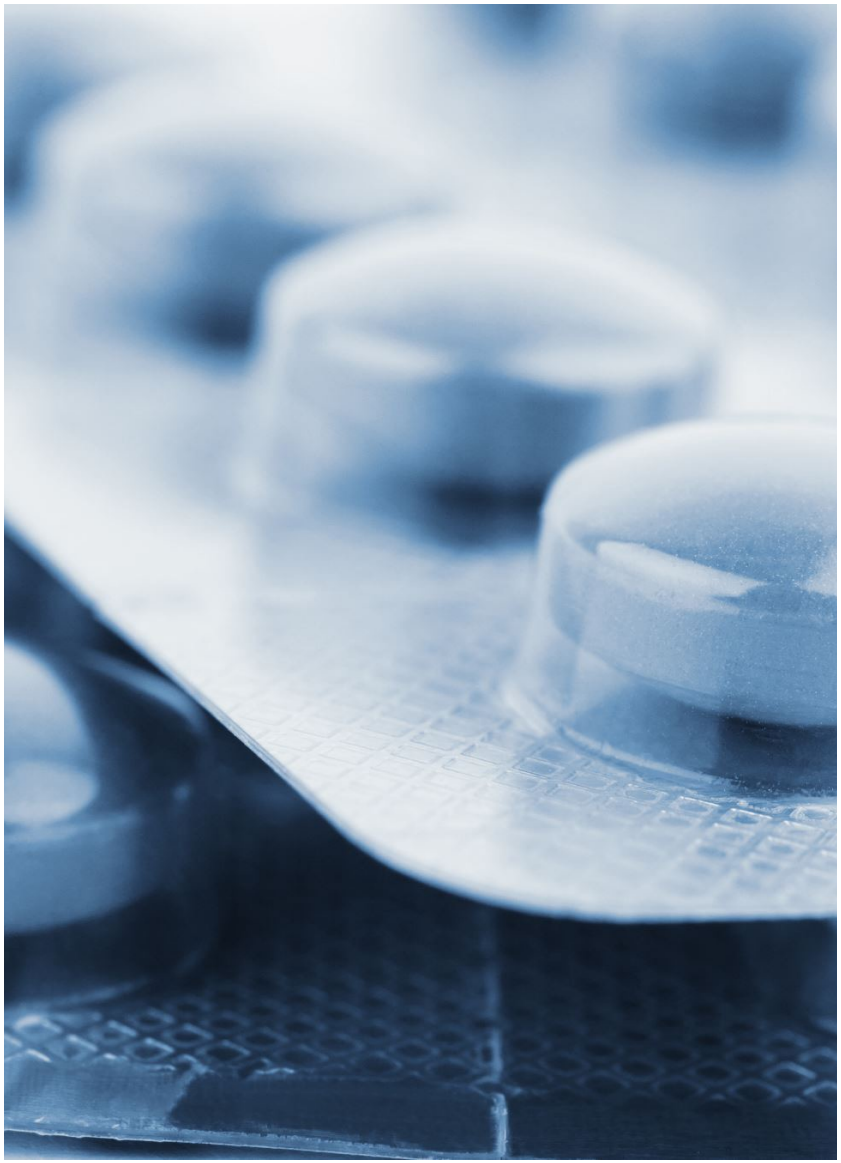
- HTN * 10 years – no h/o stroke, MI
  Usual BP is maintained at 140/90 Good compliance

- Dyslipidaemia * 10 years

- Hypothyroidism *20 years Good compliance to treatment

- Vaccination – 2 doses of covid vaccination

- Parkinson's disease – on treatment for approx. 4 years



- Drugs-
  - Losartan 25mg bd
  - Rosuvastatin 10mg daily
  - Thyroxine 100mcg mane
  - Syndopa 275mg 4 times a day
  - Syndopa CR 250mg nocte

medication administered by the caregiver.

No over the counter/ native medication use.

Home and environment

- Lives in a 2 story house. Tiled floor. No clutter

- Patient's room changed to a room in the ground floor with attached bathroom (easily accessible)

- Bathroom- commode
  Water supplied by the tap
  Good lighting and ventilation.

- Non alcohol consumer
  Non smoker

- Hobbies- watching tv, music, gardening -- disinterest for the last 6 months.

- Used to live alone while abroad and due to increased dependency moved back to Sri Lanka.

- Needs a regular caregiver

- Significant caregiver burden.

  Current primary carer is son who moved from overseas to take of the mother.

  Resigned from his job to come back to Sri Lanaka

  Wife was unhappy about their financial situation and wants to move back

  Hoping to start a family.

  Subfertility and undergoing fertility treatment.

EXAMINATION

- Febrile (101^0 F)
- Good hygiene, not dehydrated.
- Vitals-

  Pulse 96 bpm regular good volume

  Blood pressure 110/ 70 mmHg (No postural drop)

  SpO_2 97% on room air

Delirium

Confusion Assessment Method (CAM)

-Acute hange of fluctuating course of mental status

-Inattention

-Altered level of consciousness

RASS +1

Neurology

GCS- E4 V4 M6 – 14/15

Confused

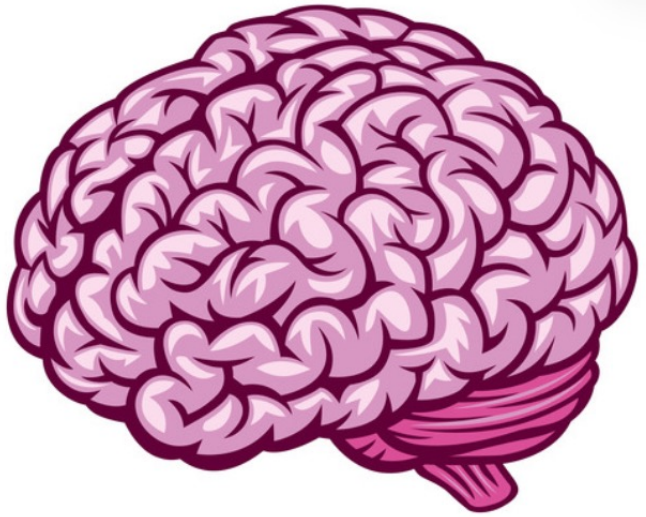
BL Pupils symmetric and reactive

BL fundi – no optic disc edema

No neck stiffness / kernigs sign

	UL		LL	
	Right	Left	Right	Left
TONE	N	N	N	N
POWER	4	4	4	4
REFLEXES	+	+	+	+
PLANTER			down	down
SENSORY	N	N	N	N

- Cranial Nerve + cerebellum- NAD
- Lungs- VB, no added sounds
- CVS- JVP not elevated
  S1 S2 M0
- Abdomen- supra pubic tenderness
  No renal angle tenderness
  No organomegaly



- Gait- stooped posture.

  wide based slow short shuffling

  difficulty in turning (en bloc)

- No rigidity, tremor
- Bradykinesia +

- TUG >60s

- Chair raise test – could not perform without assistance

  (difficult to sit or stand up → instability)

- Grip strength- right- good, left- good.

FRAX score (without BMD)- MOP #. 10% ; hip fracture 1.9 %

- MMSE 13

  orientation- 6/10

  registration - 2/3

  recall -0/3

  attention and calculation- 0/5

  language - 5/8

  copying -0/1

- GDS 2/4

CLINICAL FRAILTY SCALE

1 **VERY FIT** — People who are robust, active, energetic and motivated. They tend to exercise regularly and are among the fittest for their age.

2 **FIT** — People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g., seasonally.

3 **MANAGING WELL** — People whose **medical problems are well controlled**, even if occasionally symptomatic, but often are **not regularly active** beyond routine walking.

4 **LIVING WITH VERY MILD FRAILTY** — Previously "vulnerable," this category marks early transition from complete independence. While **not dependent** on others for daily help, often **symptoms limit activities**. A common complaint is being "slowed up" and/or being tired during the day.

5 **LIVING WITH MILD FRAILTY** — People who often have **more evident slowing**, and need help with **high order instrumental activities of daily living** (finances, transportation, heavy housework). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation, medications and begins to restrict light housework.

6 **LIVING WITH MODERATE FRAILTY** — People who need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 **LIVING WITH SEVERE FRAILTY** — **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~6 months).

8 **LIVING WITH VERY SEVERE FRAILTY** — Completely dependent for personal care and approaching end of life. Typically, they could not recover even from a minor illness.

9 **TERMINALLY ILL** — Approaching the end of life. This category applies to people with a **life expectancy <6 months**, who are **not otherwise living with severe frailty.** (Many terminally ill people can still exercise until very close to death.)

SCORING FRAILTY IN PEOPLE WITH DEMENTIA

The degree of frailty generally corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

In **very severe dementia** they are often bedfast. Many are virtually mute.

DALHOUSIE UNIVERSITY

Rockwood K et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489–495.

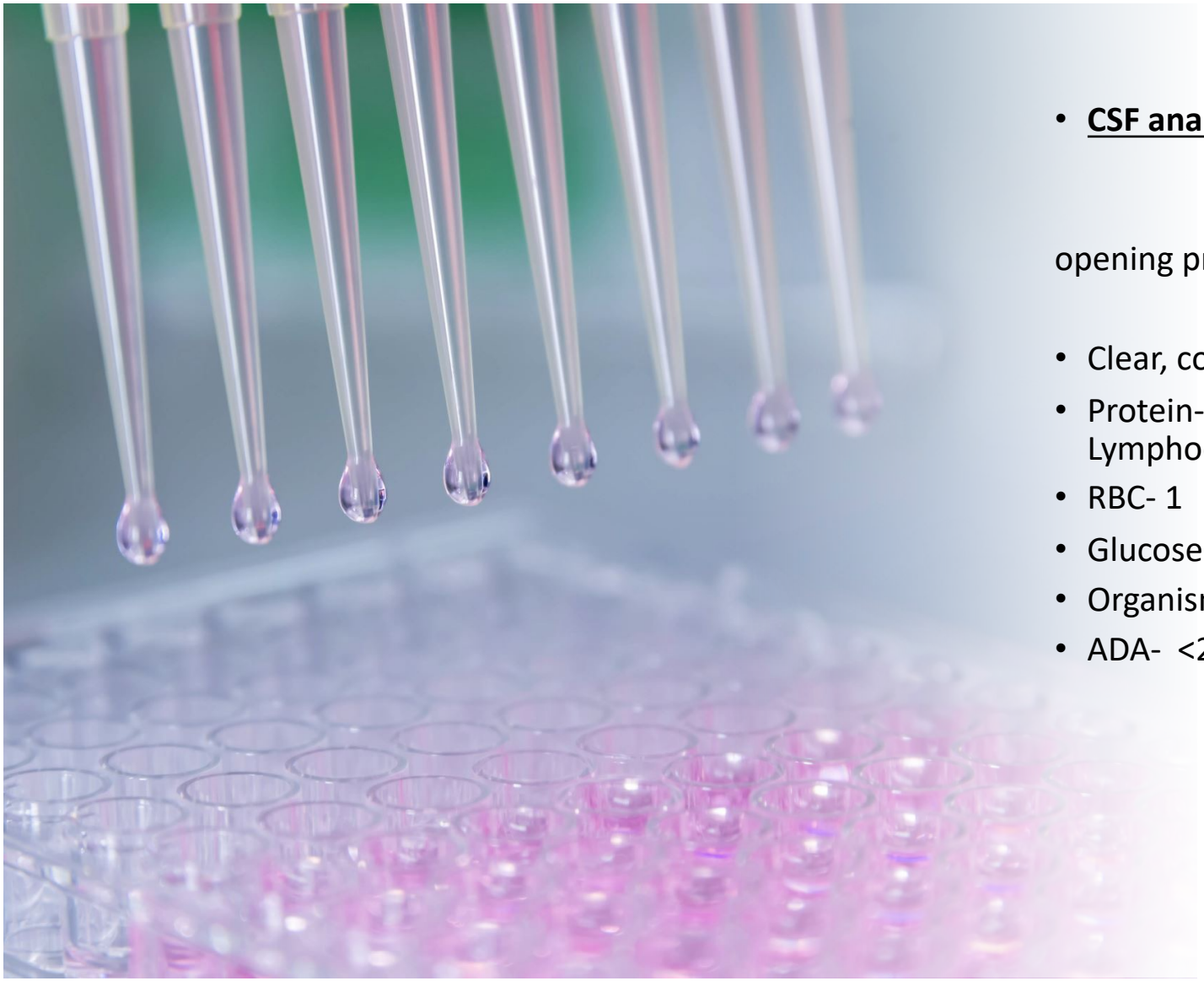
- Barthel index- 45/100

  Bowel – 10 (continent/ independent)
  Bladder - 0 (incontinent- unable to manage alone)
  Grooming - 5 (independent)
  Toilet - 5 (needs help)
  Feeding -10 (independent)
  Transferring - 5 (needs major help – 1-2 people)
  Mobility -5 (wheelchair independent)
  Dressing - 5 (needs help)
  Stairs - 0 (unable)
  Bathing - 0 (dependent)

INVESTIGATIONS

- **Culture posistive UTI**

- USS abdomen – NAD



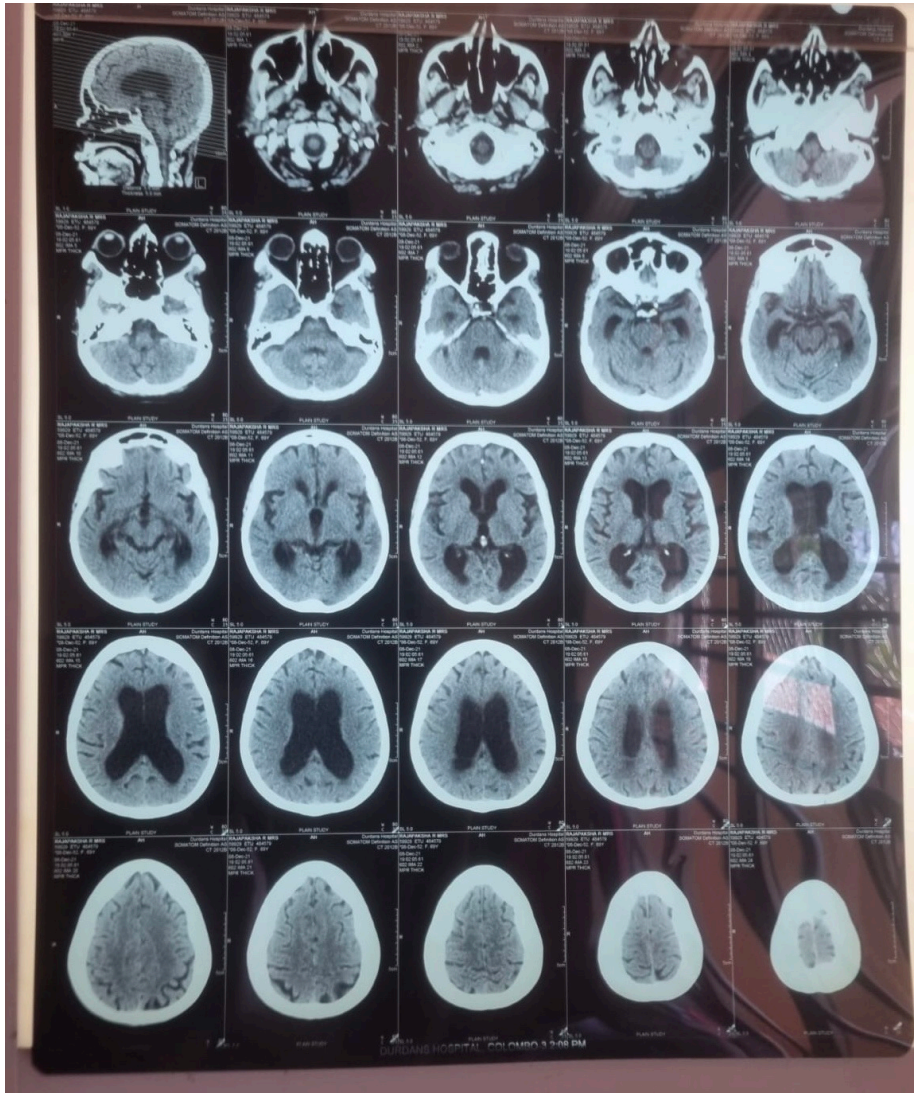
- **<u>CSF analysis</u>**

opening pressure 8 mmHg

- Clear, colourless
- Protein- 26
  Lymphocytes- 2
- RBC- 1
- Glucose -96 (CBS- 114)
- Organisms- Nil
- ADA- <20

NCCT BRAIN

- ventricular system was dilated disproportionate to the atrophy present.
- No hemorrhages / mass lesions.
- No midline shift.
- No cerebral edema.



MRI BRAIN

- No midline shift/ masses. No cerebral edema.
- The ventricular system was dilated out of proportion to the atrophy present.
- Minimal bilateral periventricular white matter hyperintensities noted in the T2WI/FLAIR in the deep subcortical parietal regions.
- Early white matter ischemia/ small vessel disease.

TAP TEST

	0	2	24	48 hrs
MMSE	13	15	16	16
TUG	>60s		>60s but Mild improvement	
GAIT			Mild improvement	

THERAPEUTICS

- OT, PT input was valuable for fall prevention, home modification and for restoration of patient's independence.
- Sertaline 25mg was started and uptitrated to 50mg daily with electrolyte monitoring
- Gradually tailed off syndopa.
- With MDT assessment (including neurologist and Neurosurgeon) Ventriculoperitoneal shunting was not offered.
- Gynecological opinion on UV prolapse – conservatively managed.

Normal Pressure Hydrocephalus

- Normal-pressure hydrocephalus (NPH) is a chronic neurological disorder characterized by enlarged ventricles but with a normal cerebrospinal fluid (CSF) pressure
- Colombian neurosurgeon Salomón Hakim in 1965
- Triad of clinical symptoms affecting gait, cognition, and urinary continence.
- NPH is divided into an idiopathic and a secondary form (subarachnoid haemorrhage, meningitis, intracranial tumours, traumatic brain injury, among other possible causes of poor cerebrospinal fluid reabsorption)

It is assumed that these conditions lead to an inflammatory process of the arachnoid granulations, with reduced CSF reabsorption and alteration of the CSF flow dynamics, resulting in ventricular dilatation.

- Gait disturbance is the most commonly encounted symptom and, in most cases, the earliest. Present in upto 89% of patients diagnosed with NPH.
- Labeled mainly as “apraxic gait” or “magnetic gait”,
- Characteristically, the patient moves more slowly, with short steps, wide base and changes in direction using several steps, with the movement being fragmented or en bloc. There may be a posture of anterior inclination of the trunk, difficulty in climbing stairs and in performing transitional movements, such as sitting and standing up.
- The patient can more easily reproduce the gait movement in the sitting or supine position.
- Postural instability is common in these patients
- Atypical presentations of NPH has been reported. Absence of gait impairment indicate a poor prognosis.

- Cognitive decline is secondary to frontal-subcortical pathway dysfunction, which mainly leads to a slowing of information processing speed and executive dysfunction.
- Cognitive impairment is present in 79% of patients diagnosed with NPH.

- The patient may present with dementia itself, as well as mild cognitive impairment.

- Difficulty in sustained attention, abstract thinking, planning, decision making, and problem solving is observed.

- Eventhough Mini mental state examination (MMSE), Montreal Cognitive assessment Assessment (MOCA) are widely used they maybe insensitive to the areas of cognitive functions affected in NPH.

- More forcused cognitive function testing can be utilised
  - Trails A & B
  - Symbol digit modality testing
  - Hopkin's verbal learning test

- Urinary symptoms are defined as an uninhibited neurogenic bladder, with urgency, increased frequency, with or without incontinence in the early stages. Present in upto 44% of patients. Considered a late feature.

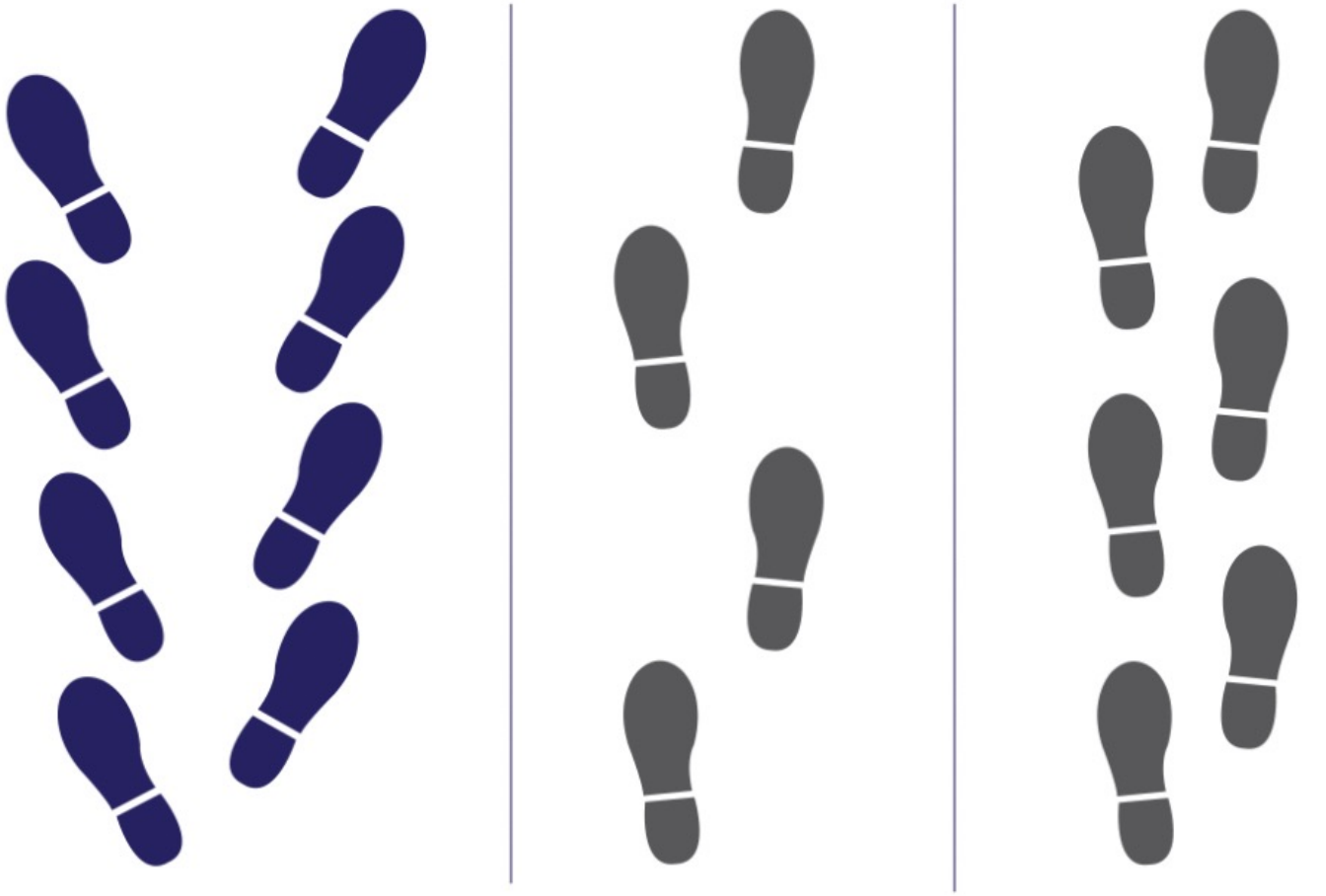

iNPH
Gait
Normal
Gait
Parkinson's
Gait

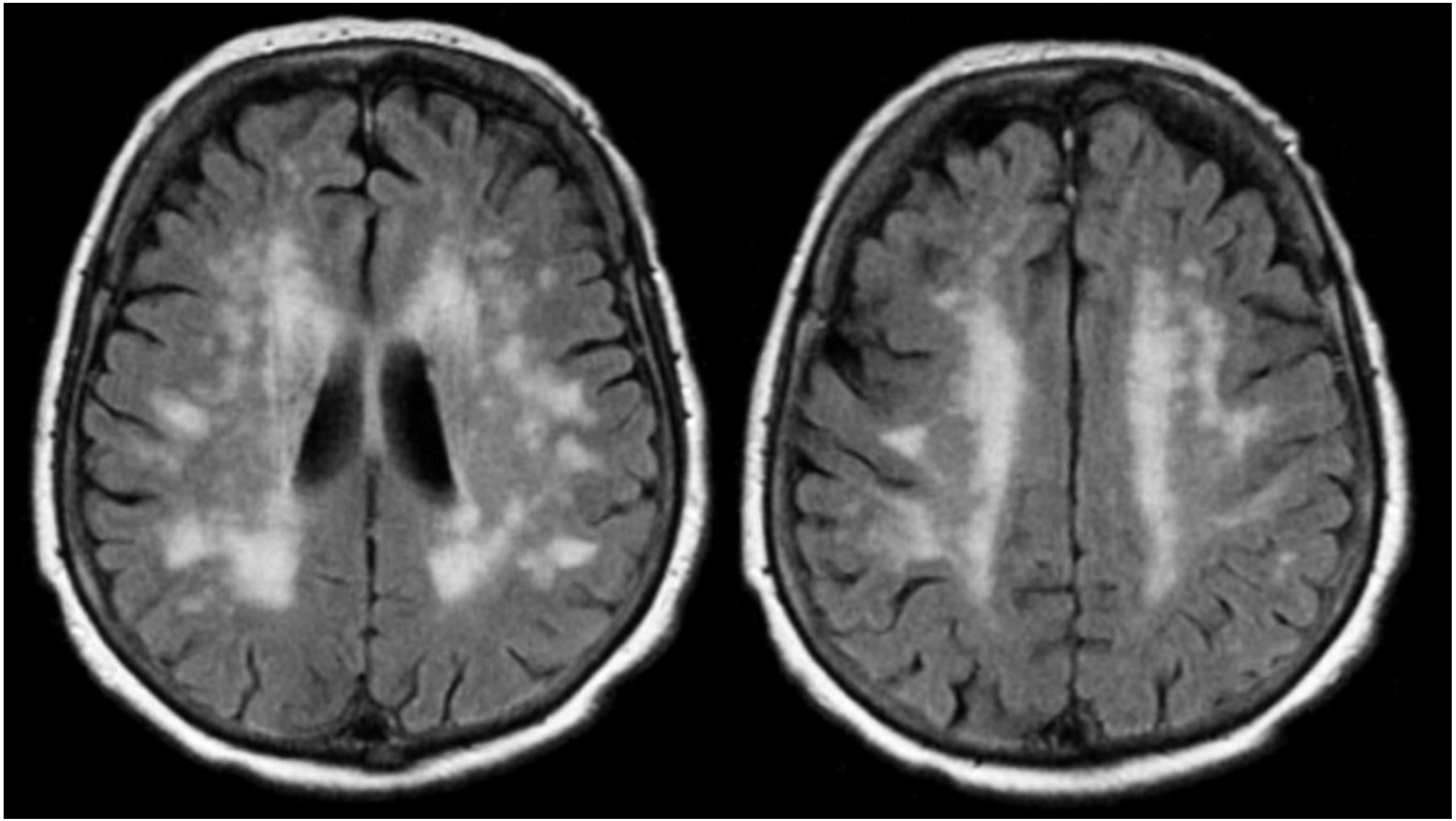
Table 12.1 Comparison of cognitive deficits between NPH and other dementia types (X-present)

	NPH	Alzheimer's dementia	Vascular dementia
Memory impairment	Impaired retrieval	X	X
Executive dysfunction	X	X	X
Impaired visuospatial perception		X	X
Impaired language	Bradyphrenia	X	X
Impaired complex motor skills	Fine motor accuracy impaired	X	X
Psychomotor slowing	X		
Impaired attentiveness	X	Orientation impaired	
Impaired new learning		X	

Binswanger disease

- also known as subcortical vascular dementia,
- is a type of dementia that involves extensive microscopic damage to the small blood vessels and white matter.

- Features :
  - Cognitive impairment - Progressive loss of thinking, decision-making, organization, and memory
  - Changes in behavior, attention, and mood
  - Unsteady gait
  - Impaired bladder control
  - progress in a stepwise manner.



INVESTIGATIONS

BRAIN CT / MRI

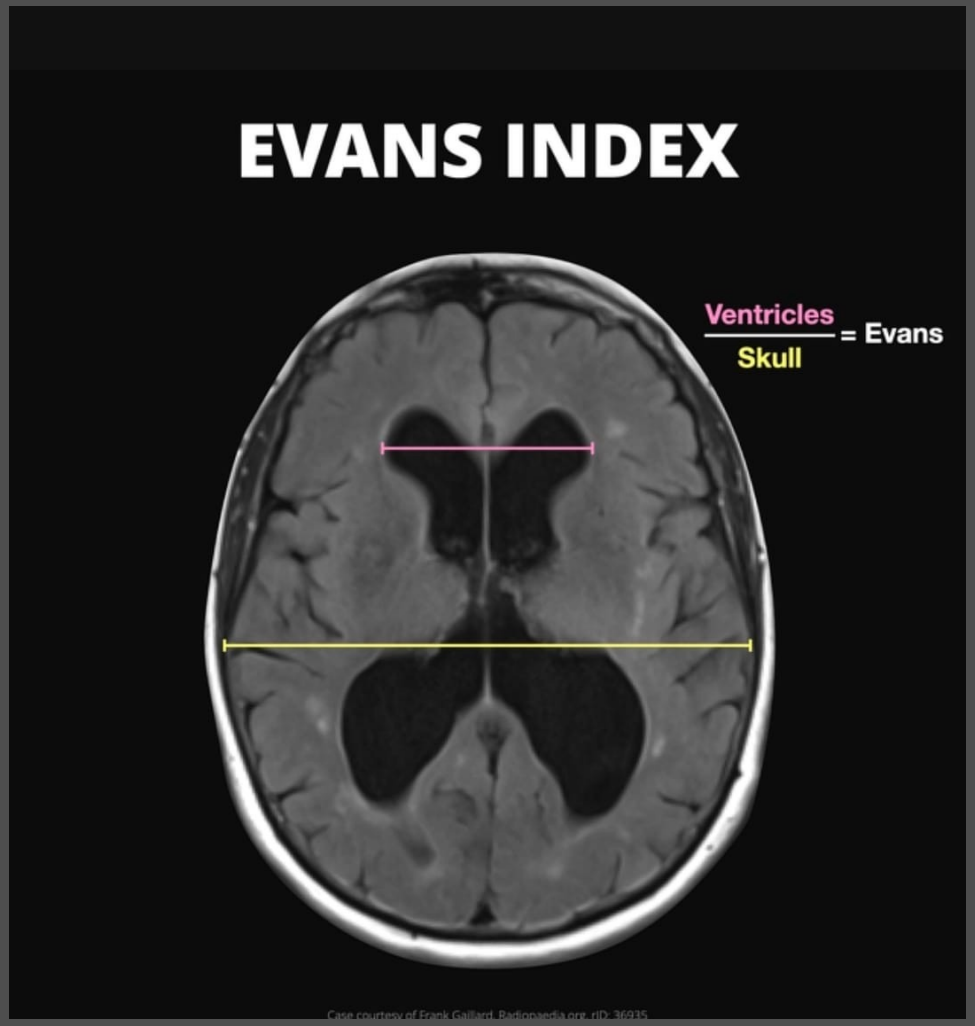
- Neuroimaging showing ventriculomegaly is essential for diagnosis, as well as for excluding NPH mimics.

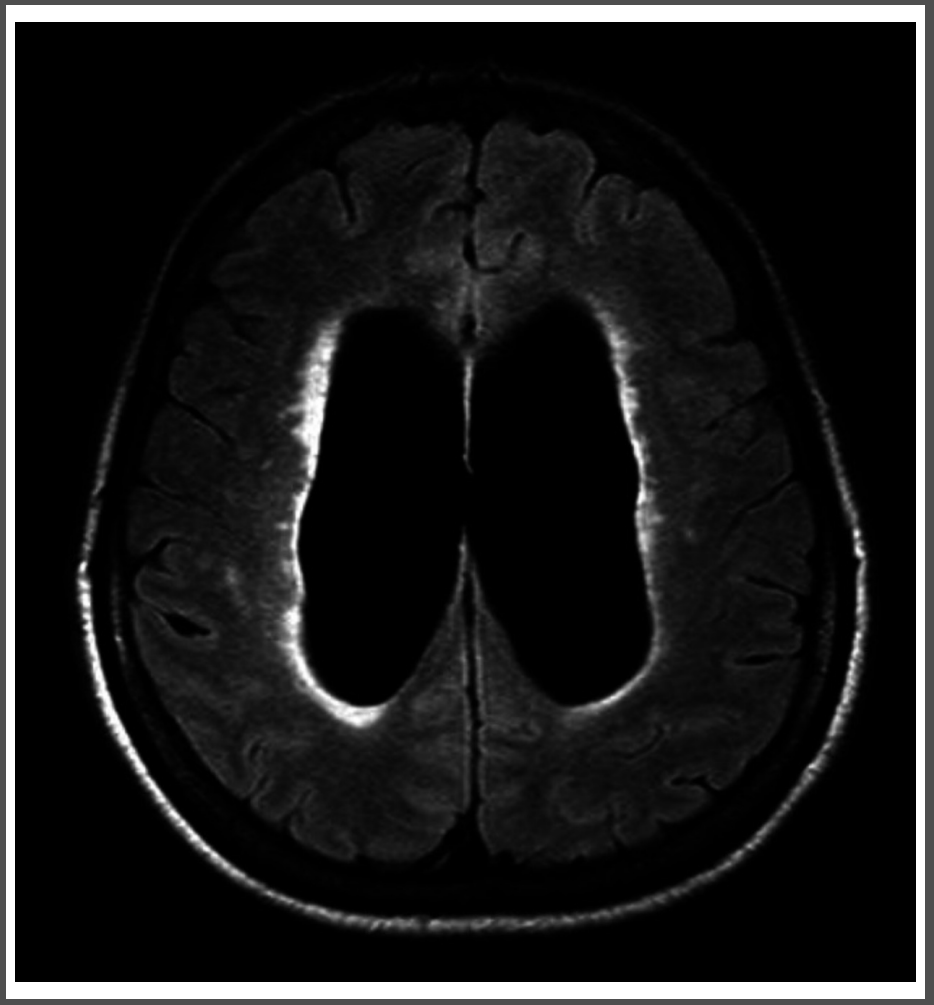
- **Evans index-** is able to diagnose and quantify ventriculomegaly. Ratio between the largest diameter between the frontal horns of the lateral ventricles over the largest diameter of the cranial vault cavity observed in the same axial section.

  A ratio greater than 0.3 indicates ventricular dilatation.

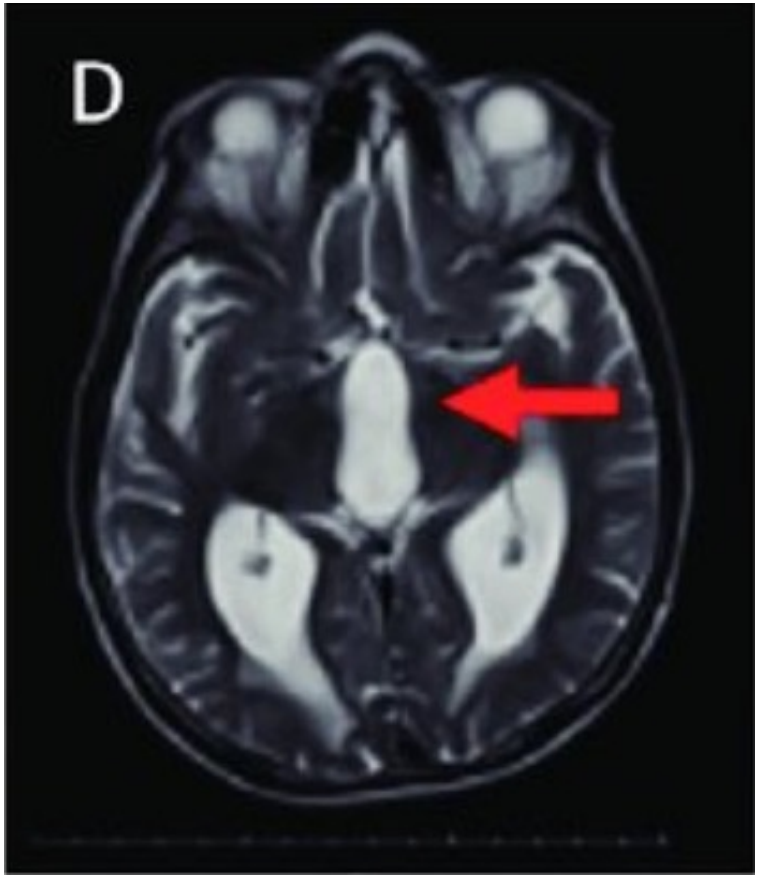
  This finding is not specific or pathognomonic of NPH

- Marginal hypersignal to the lateral ventricle margin on T2-weighted or FLAIR sequences due to ependymal CSF transudation

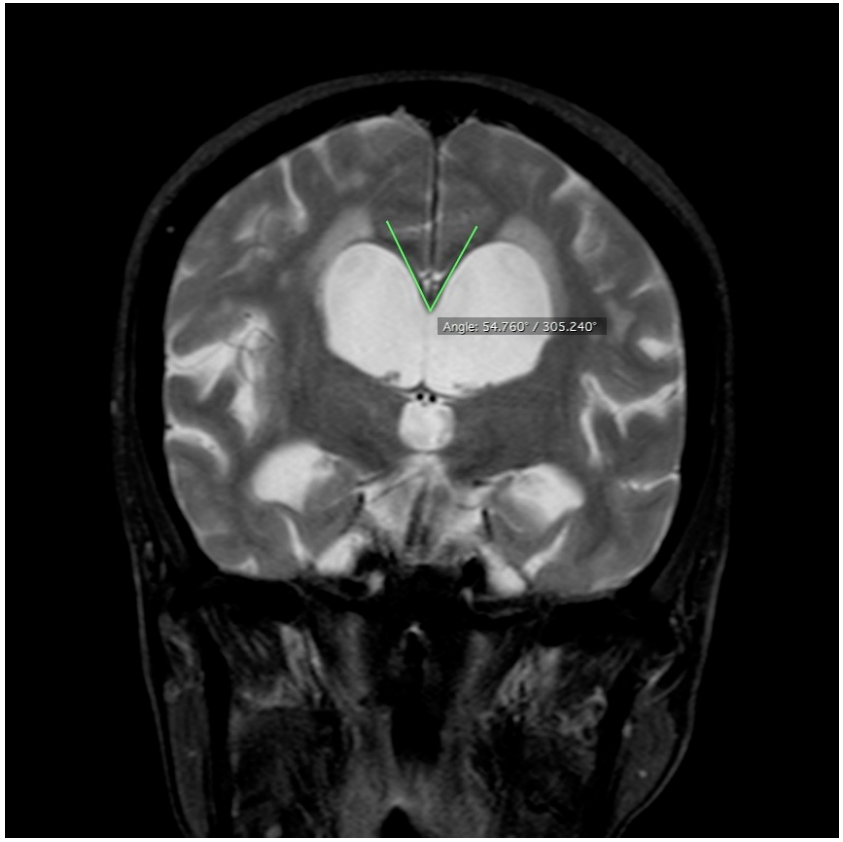




Case courtesy of Bruno Di Muzio, Radiopaedia.org, rID: 41180



prominent third ventricle dilation



Coronal view on the T1 sequence with contrast showing acute callosal angle.

Case courtesy of Bruno Di Muzio, Radiopaedia.org, rID: 41180

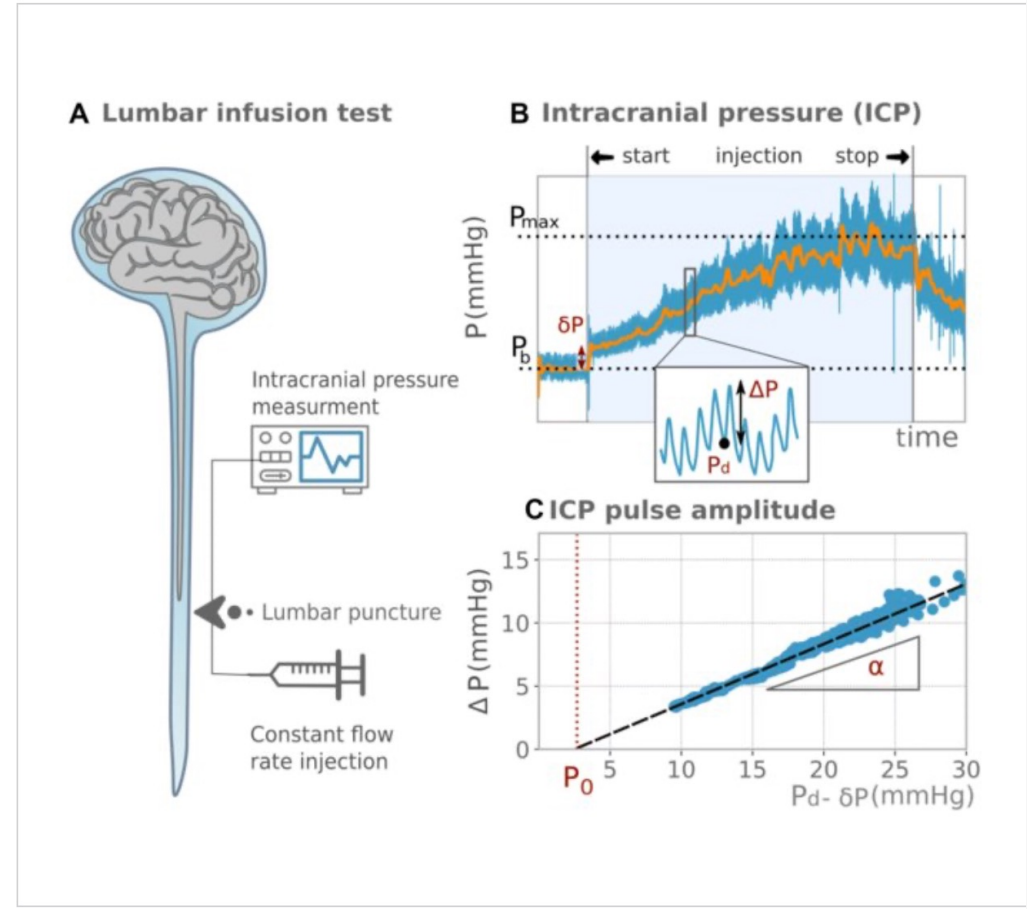
TAP TEST

Important as a pre-surgical evaluation and helps in the diagnosis when the response is positive.

It is simple, easy to perform, with low complication. Lumbar puncture is performed in the usual way, with the withdrawal of 30-50 ml of CSF. Before and after the procedure, the patient is evaluated for his cognition and gait.

Mixed study results suggesting that this test has excellent positive predictive value (90 to 100 percent), but limited negative predictive value (30 to 50 percent), with a number of patients who show no response to removal of CSF but later improve with surgery.

Others report that this test does not add predictive value over clinical and radiographic criteria

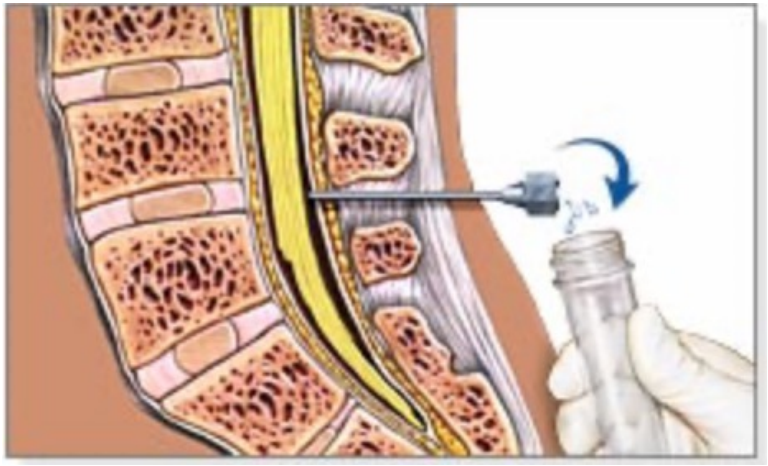


- **CSF infusion test (CSF-IT)**

Reflects the increase in resistance to fluid infusion in the subarachnoid space.

CSF-IT is performed by injecting saline or artificial CSF into the subarachnoid space and measuring the initial and final pressures (plateau) and then calculating resistance parameters.

Infusion 1 ml/min
TIME ~30 minutes



- CSF analysis –

  often normal, notably opening pressure, and can be used to rule out other pathologies.

- **TREATMENT**
- Ventricular shunting is the treatment of choice in iNPH but, in this subset of patients, the experience with the shunt can be replete with some difficulties, such as variable or short-term responses, as well as the risk of complications.

- peritoneum (ventriculoperitoneal) or to the atrium (ventriculoatrial), with no differences in the prognosis between the two.

- The immediate response to the ventricular shunting is good. In six and 12 months after the procedure, there is evident clinical benefit in 90 and 80% of the patients, respectively.

- There are no studies investigating the long-term outcome of patients not eligible for shunting, and there is still no evidence that the temporary benefit of ventricular shunting can be sustained over years

- **Patient selection —**

Because of the lack of a gold standard for diagnosing NPH, the limited predictive ability of confirmatory tests, and the invasive nature of implanted shunts, patient selection for shunting is complicated and should be individualized.

The absence of any one favorable predictor or the presence of a negative predictor does not rule out the possibility of a shunt response.

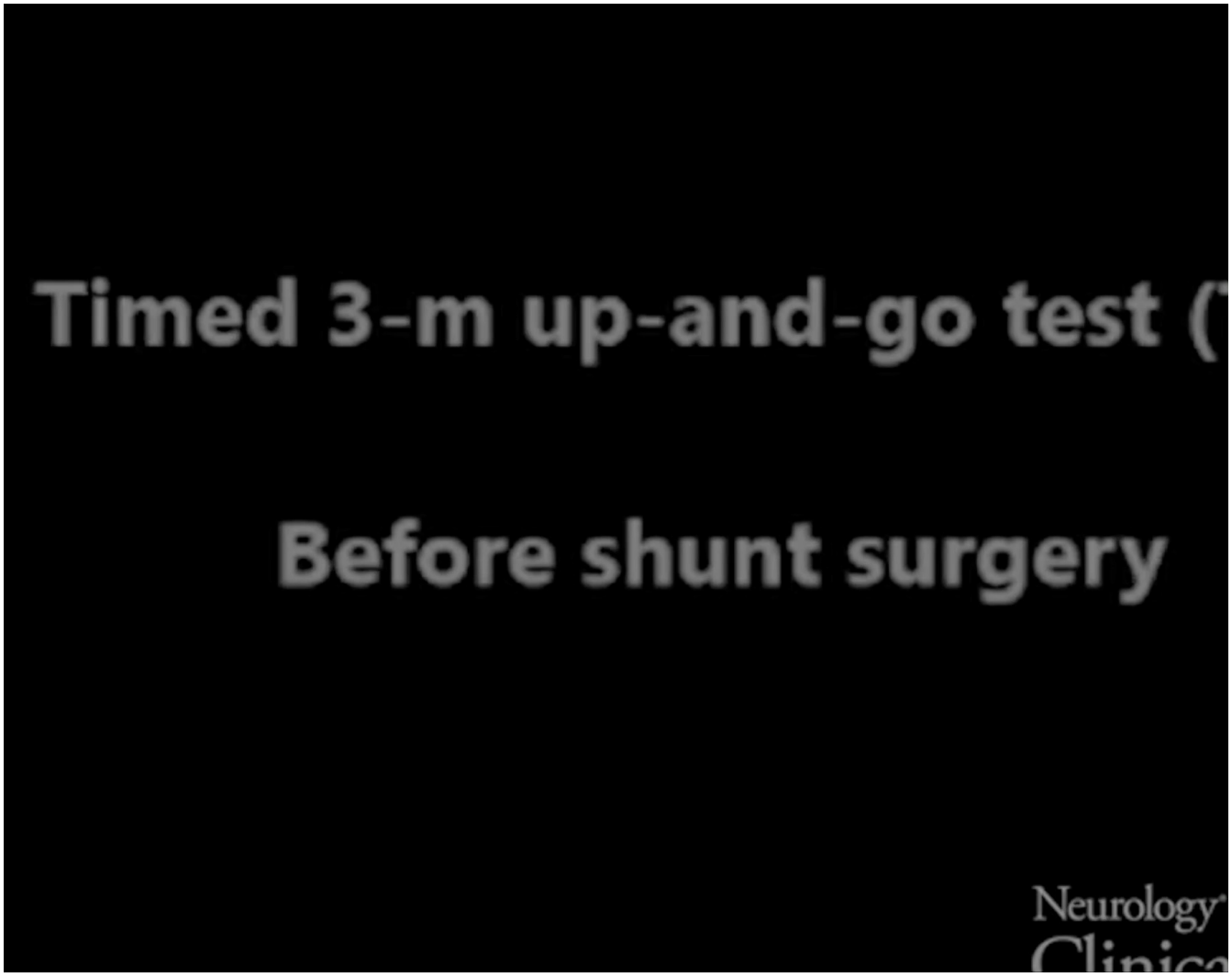
Predictors of improvement after shunting for normal pressure hydrocephalus

Favorable indicators*
Early appearance of gait disorder
Gait disorder most prominent symptom
Shorter duration of symptoms (<6 months)
Identified etiology of NPH
Clinical response to CSF removal (tap test, lumbar drain)
Unfavorable indicators*
Early appearance of dementia
Moderate to severe dementia
Dementia present for more than two years
Gait disorder absent or appearing after dementia
Alcoholism
MRI findings:
▪ Marked white matter disease
▪ Diffuse sulcal enlargement
▪ Medial temporal atrophy

NPH: normal pressure hydrocephalus; CSF: cerebrospinal fluid; MRI: magnetic resonance imaging.
* Any one factor is not decisive in selecting patients for surgery.

Mrs HP. - **unfavourable factors**

- Early appearance of gait impairment . Duration 8 years
- Moderate dementia – indicating progression of NPH
- Urinary incontinence – late sign of NPH
- Minimum improvement in TAP TEST (MMSE, GAIT, TUG)



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THANK YOU