FRONTAL AND PARIETAL LOBE SIGNS

INTRODUCTION

- Gnosia synthesis of sensory impulses resulting in perception, appreciation and recognition of stimuli.
- Agnosia is inability to recognize the meaning of a sensory stimuli even though it has been perceived
- Apraxia inability to perform a familiar, purposeful motor act on command that the patient is able perform spontaneously

FRONTAL LOBES

- Precentral cortex - strip immediately anterior to the central or Sylvian fissure
- Prefrontal cortex - extending from the frontal poles to the precentral cortex and including the frontal operculum, dorsolateral, and superior mesial regions
- Orbitofrontal cortex including the orbitobasal or ventromedial and the inferior mesial regions and
- Superior mesial regions containing, primarily, the anterior cingulate gyrus

FRONTAL LOBES

- The dorsolateral frontal cortex is concerned with planning, strategy formation, and executive function.
- The frontal operculum contains the centre for expression of language.
- The orbitofrontal cortex is concerned with response inhibition
- Patients with superior mesial lesions affecting the cingulate cortex typically develop akinetic mutism.
- Patients with inferior mesial (basal forebrain) lesions tend to manifest anterograde and retrograde amnesia and confabulation.

FRONTAL LOBES

- Motor strip (area 4)
- Supplementary motor area (area 6)
- Frontal eye fields (area 8)
- Cortical center for micturition
- Motor speech area
- Prefrontal area

PREFRONTAL AREA

- Main projection site for dorsomedial nucleus of thalamus
- Project to basal ganglia and substantia nigra
- 3 parts- dorsolateral, medial, orbitofrontal

DORSOLATERAL PFC

- Organization of self ordered tasks
- Executive function-plan, carry out and monitor a series of actions
- Voluntary eye movements
- Pain perception
- Emotional expression, decision making, personality, sense of time & calculation

MEDIAL PFC

- Auditory & visual associations
- Pneumonic processing

Orbitofrontal cortex

- Disinhibition
- Poor judgment and insight
- Distractibility

FRONTAL LOBE LESION

- Precentral gyrus
  - Face area- dysarthria, dysphagia
  - Hand area- C/L weakness, clumsiness, spasticity
  - Leg area- C/L weakness, gait apraxia, urinary incontinence

- Mesial aspect (cingulate gyrus F1)
  - Akinesia(bilateral akinetic mutism)
  - Perseveration
  - Hand and foot grasp
  - Salutatory seizures (fencer's posture)
  - Alien hand sign
  - Transcortical motor aphasia (dom. hemisphere)
  - Difficulty in initiating C/L arm movements
  - B/L ideomotor apraxia

FRONTAL LOBE LESION

- Lateral aspect (premotor area)
  - Middle frontal gyrus(F2)
    - Impaired C/L saccades
    - Pure agraphia (dom. hemisphere)
    - C/L weakness of shoulder and hip
    - Hemiakinesia (intentional neglect)
  - F3
    - Motor aphasia (dom. hemisphere)
    - Motor aprosodia (nondom. hemisphere)

FRONTAL LOBE LESION

- Orbitofrontal area (prefrontal)
  - Blunted affect (apathetic, indifferent)
  - Impaired appreciation of social nuances
  - Impaired goal directed behaviour
  - Impotence
  - Facetiousness (witzelscuht)
  - Speech apraxia
  - Inability to plan and executive multistepped process
  - Abulia (poverty of thought action and emotion)

FRONTAL LOBE SYNDROMES

- **Orbitofrontal** (disinhibited)- Disinhibition and changes of affect, impulsive, jocular affect (witzelsucht), euphoria, emotional lability, poor judgment, insight & distractibility
- **Frontal convexity** (apathetic) disturbance of movement and action, angry aggressive, psychomotor retardation, motor perseveration, poor abstraction

FRONTAL LOBE SYNDROMES

- **Medial frontal syndrome (akinetic)**

  Mutism, gait disturbance and incontinence

  paucity of spontaneous movement, gesture and verbal output, loss of sensation and incontinence

- **Massive frontal syndrome-** apathetic, akinetic, abulia syndrome, pt unaroused, unable to complete tasks or listen to commands

CLINICAL DISORDERS -FRONTAL LOBE PERSONALITY CHANGE

- Loss of drive, apathy, decreasing concern about personal appearance, hygiene, family/ business affairs

  "Apathetic dementia"
- Inability to inhibit micturition reflex
- Antisocial behavior
- Memory impairment

CLINICAL DISORDERS -FRONTAL LOBE

- Impaired judgment
- Sexual promiscuity
- Lack of adaptation to unfamiliar situations
- Emotional lability
- Senseless joking-witzelsucht
- Abulia – difficulty in initiation and sustaining spontaneous movements

EPILEPTIC EVENTS

- 4 types of seizures point to Frontal disturbance
  - Adversive fits-head and eye turn away from discharging cortex
  - Focal motor epilepsy
  - Status epilepticus
  - Temporal lobe attacks- frontal polar lesions

EXTRA-CEREBRAL MANIFESTATIONS

- Intellectual deficits
- Blindness
- Loss of sense of smell

FRONTAL RELEASE SIGNS

- Primitive reflex- sign of frontal lobe disorders
- Normally elicited in the newborn.
- As the brain matures, certain areas (usually within the frontal lobes) exert an inhibitory effect causing the reflex to disappear.
- When disease processes disrupt these inhibitory pathways the reflex is "released"
- Palmar reflex has good localizing value-signifies damage to the frontal lobe of the opposite side.

Some frontal release signs and their role in infancy:

- Palmar grasp:- Baby naturally grabs objects.
- Palmomental reflex:- unknown.
- Rooting reflex:- Baby finds breast to suckle.
- Sucking reflex:- Baby sucks breast / bottle teat to get milk.
- Snout reflex:- Involved in suckling.
- Glabellar reflex:- May protect eyes in certain situations.

DYSEXECUTIVE SYNDROME

- Phineas Gage suffered a severe frontal lobe injury in 1848
- has been called a case of Dysexecutive syndrome
- anger and frustration," slight memory impairment, and "difficulty in planning".
- utilisation behaviour, depression, aggression, inappropriate sexual behaviour, or "inappropriate humour and telling of pointless and boring stories“
- he was not able to return to his work for the railroad

DYSEXECUTIVE SYNDROME

Cognitive symptoms

- Short attention span
- Poor working memory
- Poor short term memory
- Difficulty in planning and reasoning
- Environmental dependence syndrome

Emotional symptoms

- Difficulty in inhibiting emotions, anger, excitement, sadness etc...
- Depression, possibly due to above.
- Occasionally, difficulty in understanding others' points of view, leading to anger and frustration.

Behavioural symptoms

- Utilization behaviour
- Perseveration behaviour
- Inappropriate aggression
- Inappropriate sexual behaviour
- Inappropriate humour and telling of pointless and boring stories (Witzelsucht)

CAUSES OF FRONTAL LOBE DYSFUNCTION

- Closed head injury - damage to the orbitofrontal cortex
- Pre-frontal lobotomies results in a frontal lobe syndrome.
- Cerebrovascular disease may cause a stroke in the frontal lobe
- Tumours - meningiomas may present with a frontal lobe syndrome
- Degenerative diseases - Alzheimer's disease, frontotemporal dementia and Pick's disease.
- Mental retardation
- Normal-pressure hydrocephalus and other hydrocephalic disorders
- Alcohol & recreational drugs intoxication
- Psychiatric disorders- schizophrenia, depression, attention-deficit hyperactivity disorder (ADHD), and antisocial personality disorder or psychopathy

FURTHER INVESTIGATION

- Wisconsin card sort test- concept formation and ability to shift mental sets
- Mazes subtest – planning
- Trail making test - switching between plans
- Stroop test - distracting stimuli
- Brain imaging

PARIETAL LOBE FUNCTION

- Somesthetic/reception area-tactile, pressure and position sensation, intensity recognition
- Sensory association area- synthesis and interpretation of impulses- stereognosis, graphesthesia, two point discrimination and tactile localization
- Angular and supramarginal gyri- language

PARIETAL LOBE LESION

- Post central gyrus
  - Contralateral sensory loss (astereognosia>JPS>touch>pain,temp,vibration)
  - Contralateral pain , paraesthesias
- Cuneus
  - Transcortical sensory aphasia(dom. hemisphere)
  - Attention disorder

- Superior and inferior Parietal lobules
  - Dominant hemisphere
    - Parietal apraxia
    - Finger agnosia
    - Acalculia
    - Right –left disorientation
    - Literal alexia(supramarginal gyrus)
    - Conduction aphasia

- Superior and inferior Parietal lobules
  - Non-dominant hemisphere
    - Anosognosia
    - Autotopagnosia
    - Spatial disorientation
    - Hemispatial neglect (sensory inattentation)
    - Construction apraxia
    - Dressing apraxia
    - Loss of topographical memory
    - Allesthesia
    - Hemisomatognosia
    - Asymbolia for pain

CLINICAL FEATURES-PARIETAL LOBE DAMAGE

- Cortical sensory loss- astereognosis, agraphesthesia, loss of 2 pt discrimination
- Dysphasia-dominant hemisphere
- Non dominant lobe- apraxia, hemi-inattention, denial of disability
- Inferior quadrant/hemianopia, Loss of optokinetic nystagmus

CLINICAL FEATURES-PARIETAL LOBE DAMAGE

- Contra-lateral muscle atrophy
- Deafferentation – hypotonia, bradykinesia, ataxia and pseudoathetoid movements
- Focal motor seizures, Soft motor signs- slight increased reflexes, mild C/L facial and limb weakness and an extensor plantar response

SENSORY SYNDROMES

- Pseudothalamic syndrome
  - Fasciobrachiocrural impairment of touch, pain temp,vibration
  - Parietal operculum, post. Insula
- Cortical sensory syndrome
  - Astereognosia, agraphthesias, JPS
  - Superior post. Parietal stroke
- Atypical sensory syndrome
  - All modalities in a partial distribution

Thank you