NOTES
HEADACHES

GENERALLY, WHAT ARE THEY?

PATHOLOGY & CAUSES

- Cranial pain, disturbs everyday life

TYPES

Primary
- Migraine, tension headache, cluster headache

Secondary
- Headaches caused by other disorders

CAUSES
- Genetic, environmental factors; stress

SIGNS & SYMPTOMS

- Unilateral/bilateral, localized/diffuse head pain
- Nausea, vomiting, aura/autonomic symptoms

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan/MRI
- Used to exclude other diseases
  - Unusual neurological symptomatology; headache accompanied by ↑ body temperature, stiff neck; new headache in individual with HIV/cancer

TREATMENT

MEDICATIONS
- Prophylactic management
  - Prevention of further attacks
- Symptomatic treatment
  - Pain, symptom-management medications

CLUSTER HEADACHE

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PATHOLOGY & CAUSES

- One-sided headache in ophthalmic nerve distribution region with autonomic symptomatology
- Hypothalamus involvement
  - Episodic occurrence of cluster attacks
- Posterior hypothalamic activation → secondary trigeminal stimulation → afferents travel to nucleus caudalis
  - Projection to thalamus, sensory cortex → perception of pain
  - Hyperactivation of parasympathetic pterygopalatine ganglion → autonomic symptoms
- Cavernous sinus walls inflammation → ↓ venous flow → injury of internal carotid artery sympathetic fibers

TYPES

Episodic

- Daily episodes over 6–12 weeks; "clusters" followed by remission period up to 12 months

Chronic

- Episodes without substantial remission period

CAUSES

- Unknown; possibly genetic

RISK FACTORS

- More common in individuals who are biologically male
- Stressful periods, allergic rhinitis, sexual intercourse, tobacco, excessive alcohol use

COMPLICATIONS

- Progresses episodic → chronic

SIGNS & SYMPTOMS

- Headache
  - One-sided sharp, stabbing, burning orbital/supraorbital/temporal head pain
- Autonomic
  - Ipsilateral conjunctival hyperemia with lacrimation, nasal discharge, miosis, edema, drooping eyelid
- Episodes
  - 1–8 per day; lasts five minutes to three hours
- Restlessness, agitation, suicidal ideation

DIAGNOSIS

DIAGNOSTIC IMAGING

CT scan/MRI

- Exclude possible cranial lesions

OTHER DIAGNOSTICS

- Requires each of following
  - Five unilateral/orbital/supraorbital/temporal attacks; 1–8 episodes daily, ≤ three hours
  - Agitation/restlessness
  - ≥ one autonomic symptom on same side as headache

TREATMENT

MEDICATIONS

Acute management

- Supplemental oxygen/intranasal sumatriptan/zolmitriptan
  - Initial treatment
- Intranasal lidocaine/oral ergotamine/IV dihydroergotamine
  - If initial treatment not effective

Prophylaxis

- Verapamil
  - Episodic attacks > two months/chronic cluster headaches
- Glucocorticoids (e.g. prednisone); can be used together with verapamil
- Lithium
  - If other medications contraindicated

SURGERY

- Block greater occipital nerve
- Percutaneous radiofrequency ablation of pterygopalatine ganglion
- Gamma knife radiosurgery
- Stimulation of pterygopalatine ganglion
- Posterior hypothalamus deep brain stimulation

MIGRAINE

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PATHOLOGY & CAUSES

- Disease characterized by one-sided head pain
- Probable mechanism
  - ↑ neuronal hyperexcitability → cortical spreading depression wave across cortex → release of proinflammatory cytokines, matrix metalloproteinases (MMP), nitric oxide (NO), glutamate, adenosine triphosphate (ATP), potassium ions from neurons/glial/vascular cells → alters blood-brain barrier → activates perivascular trigeminal nociceptors
  - Release of substance P, calcitonin gene-related peptide, neurokinin A → neurogenic inflammation with meningeal blood vessels dilatation, protein exudation → further nociceptor stimulation
  - Projection of afferents to trigeminal nucleus-pars caudalis → fibers relay to thalamus, sensory cortex → perception of pain
- Trigeminal nociceptors innervate anterior head region, upper cervical dorsal roots innervate posterior head region → converge in trigeminal nucleus caudalis → characteristic pain distribution affecting anterior, posterior head region
- Aura likely caused by depression spreading to areas where perceived consciously
- Serotonin receptors possibly involved in migraine pathogenesis
  - Directly acting on blood vessels/affecting pain pathways
- If nociceptors stimulated too frequently → neuronal sensitization, cutaneous allodynia phenomenon (nociceptive response to non-nociceptive stimuli)

TYPES

Migraine with aura

- Typical aura migraine with/without headache
- Brainstem aura migraine
- Hemiplegic migraine
  - Familial; types I, II, III
  - Sporadic
- Ocular migraine

Migraine without aura

- Menstrual migraine
  - Develops ≤ two days before, continues ≤ three days after menstrual period
- Chronic migraine
  - ≥ 15 headaches per month for ≥ three months
  - Analgesics, nonsteroidal anti-inflammatory drugs (NSAIDs) overuse biggest risk factor

Probable migraine

- Attacks similar to migraine without one feature needed for migraine diagnosis

CAUSES

- Inheritance
  - ↑ neuronal excitability
- Familial hemiplegic migraine (FHM)
  - *Type I:* *CACNA1A* gene mutation
  - *Type II:* *ATP1A2* gene mutation
  - *Type III:* *SCN1A* gene mutation

RISK FACTORS

- Individuals who are biologically female, age 30–39
- Stress, hormone oscillations, irregular eating/sleeping, weather, light, alcohol, tobacco, odors
- Syndromes associated with migraine
  - Recurrent gastrointestinal (GI) disturbance; benign paroxysmal vertigo, torticollis

COMPLICATIONS

- Status migrainosus
  - Migraine lasting ≥ 72 hours without spontaneous resolution
- Persistent aura without infarction
  - ≥ one week
- Migrainous infarction
  - Preceded by migraine attack with aura symptoms ≥ one hour; retinal migraine → permanent blindness
- Migraine aura-triggered seizure
- Rebound headache due to medication overuse

SIGNS & SYMPTOMS

- One-sided, pulsatile headache worsened by physical activity, with maximum pain at supraorbital location; followed by nausea, vomiting, hypersensitivity to light and sounds
  - May be accompanied by cutaneous allodynia phenomenon
- Prodromal symptoms (appear hours/days before attack)
  - ↑ irritability to light, sound, smells; yawning, food cravings, mood changes, constipation/diarrhea
- Postdrome symptoms
  - Lasting approx. one day after headache; sudden movements → short-lasting pain in previously affected regions; exhaustion/tiredness/euphoria

Aura

- Negative features (areas of vision loss)
  - Hemianopia/quadrantanopia, peripheral vision loss, spot-like scotomas, blurriness/blindness
- Positive features
  - *Scintillating scotoma:* glimmering geometric shapes (e.g. zigzag line) appearing centrally with expansion to periphery; visual hallucinations
  - *Visual:* most common
  - *Sensory:* tingling sensations beginning from one hand → arm, face → short-lasting numbness
  - *Motor:* facial/extremities weakness
  - *Language:* progresses from mild speech impairment to aphasia
- Subtypes
  - *Brainstem aura:* dizziness, double vision, tinnitus, speech difficulties, altered consciousness
  - *Hemiplegic:* aura usually includes one-sided motor weakness; vision, sensory defects, ↑ body temperature, seizures, coma
  - *Ocular:* loss of vision/scotomas in one eye; headache

DIAGNOSIS

LAB RESULTS

- ↓ serum N-acetyl-aspartate levels

OTHER DIAGNOSTICS

Non-aura migraine

- Requires each of following
  - ≥ *five attacks:* lasting 4–72 hours
  - ≥ *two of the following:* one-sided, throbbing quality, moderately severe pain, worsening with physical activity
  - ≥ *one of following with headache:* nausea/vomiting; light, sound sensitivity

Migraine with aura

- Requires each of following
  - *Aura symptoms:* visual, sensory, motor, speech
  - ≥ *two of following:* ≥ one aura symptom lasting ≥ five minutes, followed by other aura symptomatology; auras lasting five minutes–one hour; one aura, one-sided; aura precedes headache that occurs within 60 minutes
  - ≥ *two attacks:* with listed characteristics

TREATMENT

MEDICATIONS

Mild/moderate

- NSAIDs (e.g. aspirin, naproxen, diclofenac, ibuprofen)
- Paracetamol

Moderate/severe

- Triptans
  - Serotonin agonists; constrict blood vessels, alter pain pathways
  - Sumatriptan, zolmitriptan, naratriptan, eletriptan
  - Oral/nasal/subcutaneous administration
  - Triptan, NSAID combination; more effective than individual medications (e.g. sumatriptan, naproxen)
  - Ergots (ergotamine)
- IV triptans
- Dopamine antagonists
  - IV metoclopramide; IV/IM chlorpromazine
- Ergots (e.g. dihydroergotamine)
- Dexamethasone
  - Combined with symptomatic therapy → ↓ early headache recurrence rate
- Antihypertensives
  - Beta blockers (propranolol/metoprolol/timolol)
  - Calcium channel blockers (verapamil/nifedipine)
  - Angiotensin-converting enzyme inhibitors (ACEI)/angiotensin II receptor blockers (ARBs); e.g. lisinopril/candesartan respectively
- Antidepressants
  - Tricyclic antidepressants (amitriptyline, nortriptyline, doxepin)
  - Serotonin-norepinephrine reuptake inhibitors (SNRIs) (e.g. venlafaxine)
- Anticonvulsants
  - Topiramate/valproate

OTHER INTERVENTIONS

- Complementary, alternative medicine
  - *Herbs:* butterbur (*Petasites hybridus*), feverfew (*Tanacetum parthenium*)
  - *Supplementation:* riboflavin, coenzyme Q10, magnesium

TENSION HEADACHE

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PATHOLOGY & CAUSES

- Bilateral, "tightening" headache (most common headache type)
  - ↑ tenderness of pericranial myofascial structures → activation of vasculature-surrounding nociceptors → episodic TH → prolonged nociceptor stimulation → pain pathway sensitization with hyperalgesia → chronic TH

TYPES

Episodic

- Rare (≤ one headache monthly)
- Common (≤ 14 headaches monthly)

Chronic

- ≥ 15 headaches monthly

CAUSES

- ↑ muscle tenderness
- Combination of genetic, environmental factors
  - Episodic TH
- Multifactorial inheritance
  - Chronic TH

RISK FACTORS

- White individuals who are biologically

female of Ashkenazi Jewish descent
- Age ≥ 40
- Stress, anxiety, depression, poor posture

COMPLICATIONS
- Rebound headache
- Progresses episodic → chronic

SIGNS & SYMPTOMS
- Moderate, bilateral, non-pulsating head pain
  - Band-like distribution, without worsening during physical activity, few minutes to one week
- Photophobia/phonophobia
- Stiffness/tenderness of head, neck, shoulder muscles

DIAGNOSIS
OTHER DIAGNOSTICS
Requires each of following
- Absence of nausea, vomiting
- Light/sound hypersensitivity without other aura symptoms
- ≥ two of following
  - Both sides of head affected
  - Non-throbbing quality
  - Moderate intensity
  - No worsening during physical activity

TREATMENT
MEDICATIONS
Immediate symptoms
- Analgesics
  - NSAIDs
  - Paracetamol
- Caffeine
- Butalbital
  - If contraindication for NSAIDs/caffeine-combined analgesics

Prophylactic management
- Antidepressants
  - Tricyclic antidepressants (amitriptyline, nortriptyline/protriptyline)
  - Mirtazapine/venlafaxine
- Anticonvulsants
  - Topiramate/gabapentin

PSYCHOTHERAPY
- Behavioral, cognitive-behavioral, biofeedback therapy

OTHER INTERVENTIONS
- Acupuncture, heating/icing, resting for immediate symptoms