HEADACHE

Prof. G. Zuliani

General Statistics

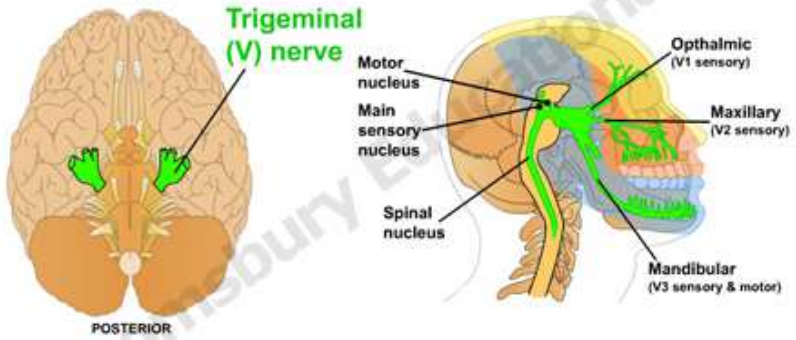
- “Everyone” has headaches (HA)
- Second most common complain after back pain in the population
- More than 80 million Emergency Room visits in USA per year
- Frequency of HA due to rich nerve supply and psychological implications of head pain

General Statistics

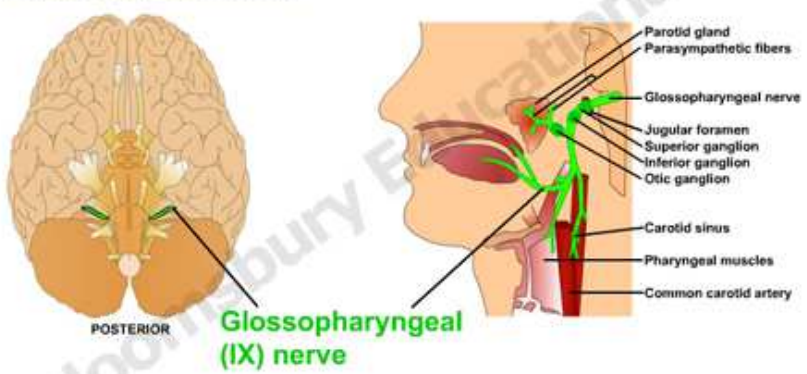
- Nerves responsible for HA have their source from myelinated fibers in **cranial nerves V (trigeminal), IX (glossopharyngeal), X (vagus), and roots of C1, C2, and C3.**

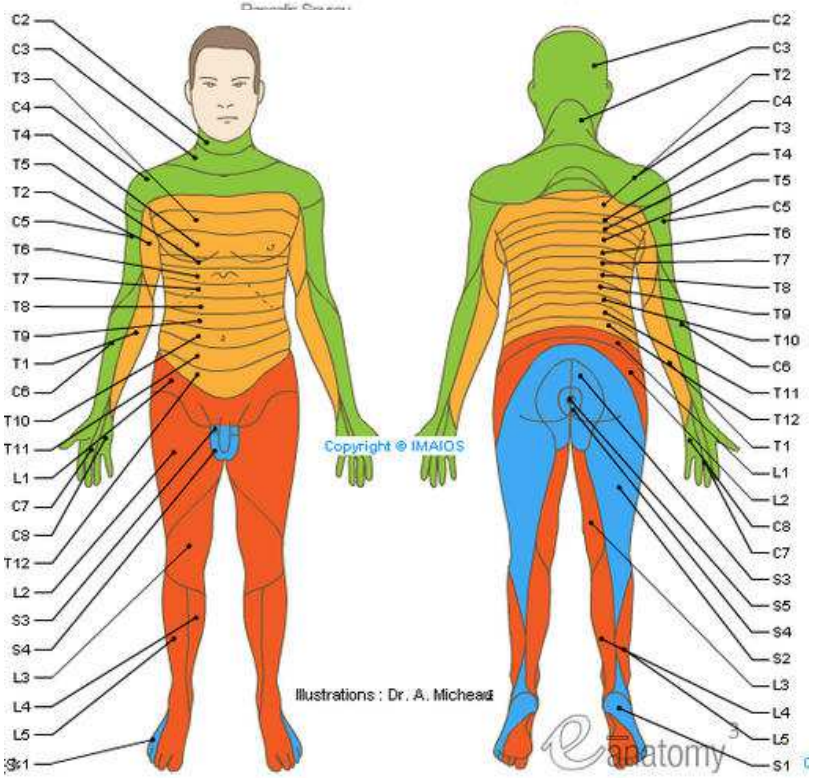
- Pain sensitive structures include: **eyes, ears, paranasal sinuses, large extra-intra cranial arteries, dural sinuses, periosteum of the skull skin, cranial muscles, and the upper cervical spine.**

Trigeminal nerve (V)



Glossopharyngeal nerve (IX)





Pascalis Spyrou

2018

Cephalalgia
An International Journal of Headache

International Headache Society

Cephalalgia
2018, Vol. 38(1) 1–211

DOI: 10.1177/0333102417738202
journals.sagepub.com/home/cep

SAGE

Headache Classification Committee of the International Headache Society (IHS)

The International Classification of Headache Disorders, 3rd edition

Part One: The Primary Headaches

1. Migraine
2. Tension-type headache
3. Trigeminal autonomic cephalalgias
4. Other primary headache disorders

Part Two: The Secondary Headaches

Introduction

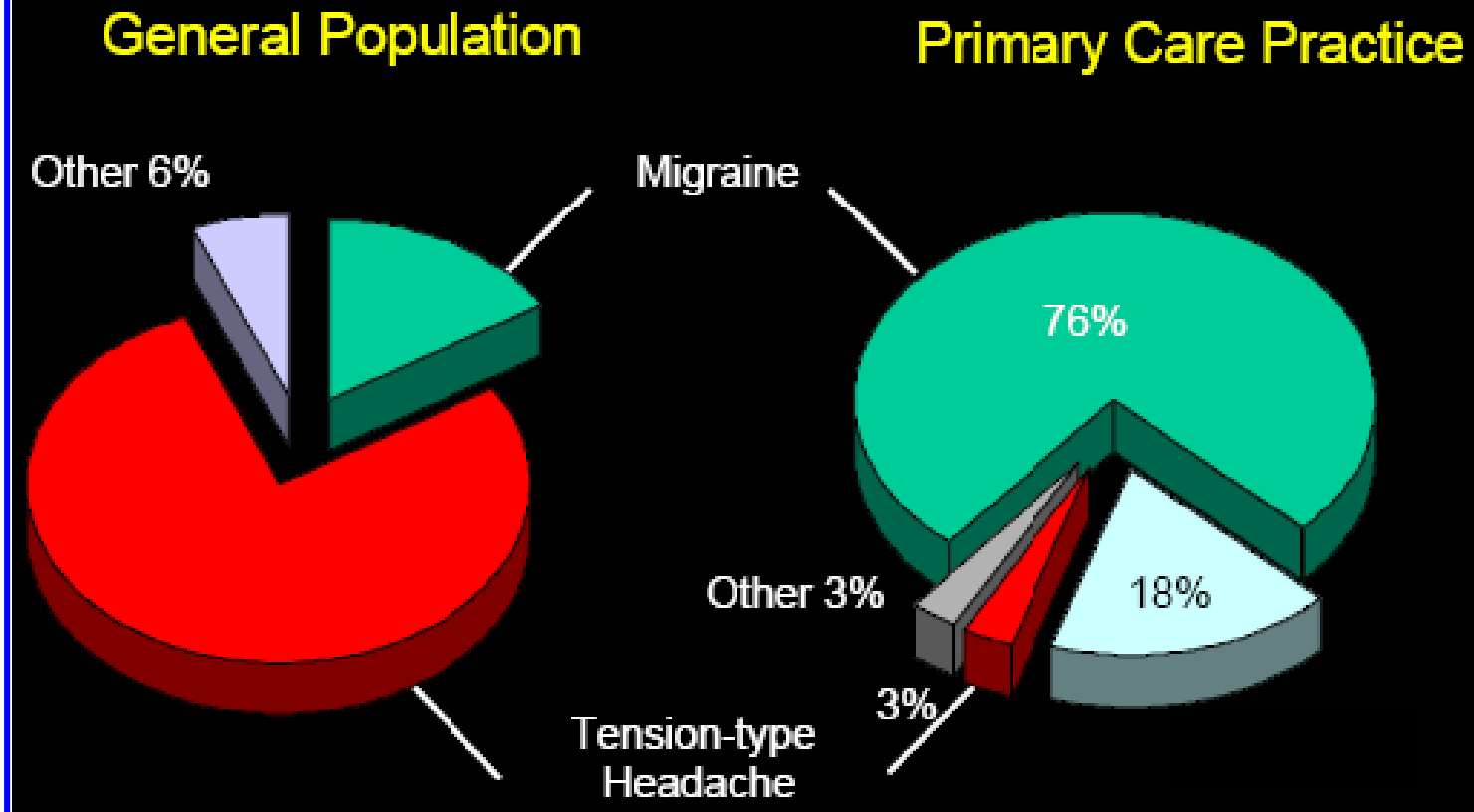
5. Headache attributed to trauma or injury to the head and/or neck
6. Headache attributed to cranial and/or cervical vascular disorder
7. Headache attributed to non-vascular intracranial disorder
8. Headache attributed to a substance or its withdrawal
9. Headache attributed to infection
10. Headache attributed to disorder of homoeostasis
11. Headache or facial pain attributed to disorder of the cranium, neck, eyes, ears, nose, sinuses, teeth, mouth or other facial or cervical structure
12. Headache attributed to psychiatric disorder

Part Three: Painful Cranial Neuropathies, Other Facial Pain and Other Headaches

13. Painful lesions of the cranial nerves and other facial pain
14. Other headache disorders

2018

PRIMARY HEADACHE: CLINICAL PRACTICE VS. POPULATION



Rasmussen BK et al. *J Cin Epidemiol.*

Dowson A et al. *Cephalalgia.*

Etiologies

- Commonly “overlooked” etiologies include:

- Food (e.g. glutammate)
- Pharmaceutical
- Withdrawal
- Fever
- Viral
- Metabolic

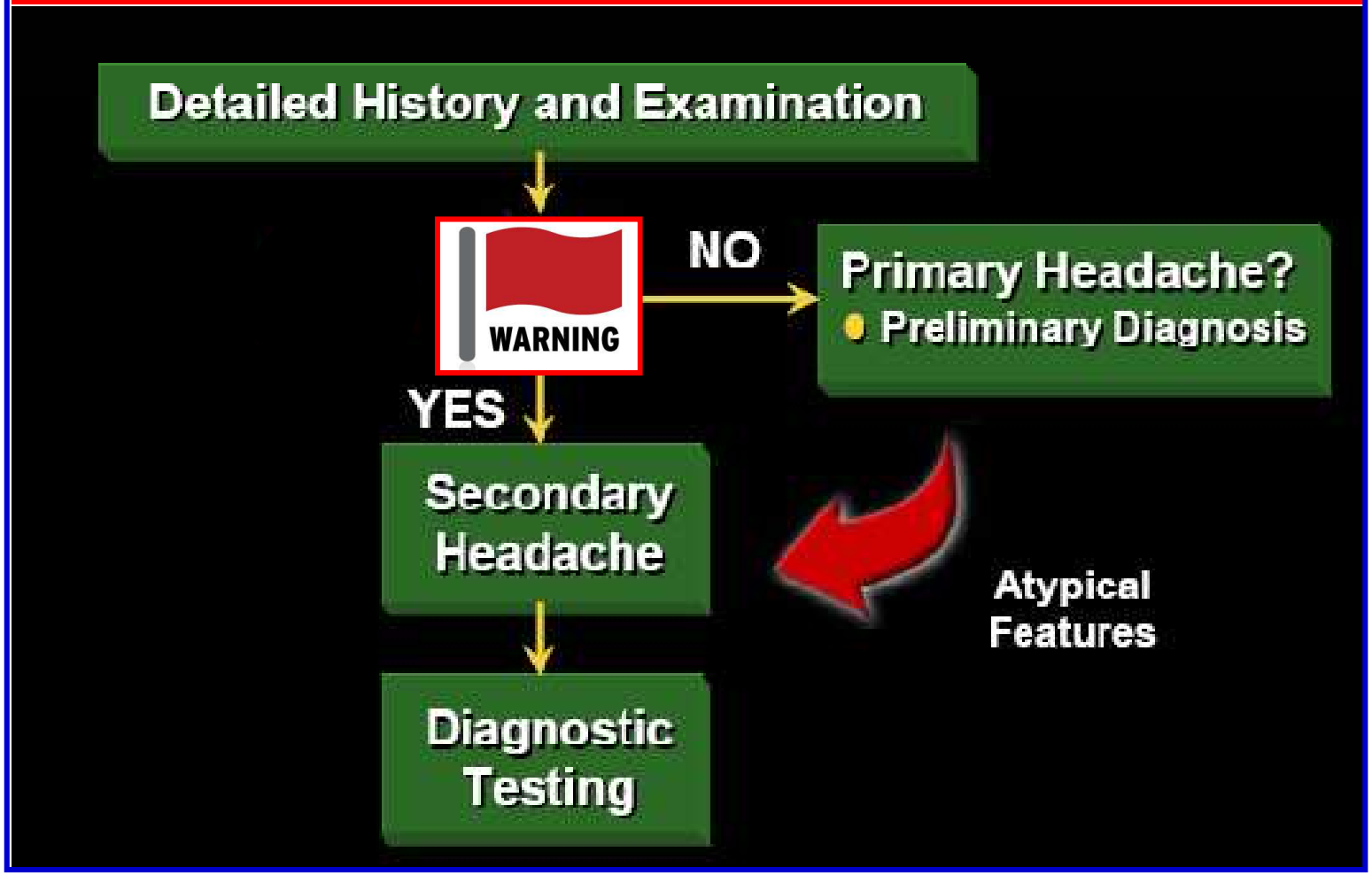
History: Questions to ask

- Character of pain
- Mode of onset
- Mode of offset (if offset…)
- Time of onset
- Relieving factors (if any)
- Aggravating factors (if any)

History: Questions to ask

- Precipitating factors (menstruation)
- Frequency of attacks
- Duration of attacks
- Associated symptoms (if any)
- Family history of headache
- Allergies

DIAGNOSIS AND TESTING



Seven danger signals of an headache

1. A “first” headache
2. Headache due to exertion
3. Headache associated with fever
4. Headache in a drowsy or confused patient
5. Headache in a patient with nuchal rigidity or meningeal signs
6. Headache in a patient with any abnormal physical signs
7. Headache in a patient who “looks ill”

Physical Examination

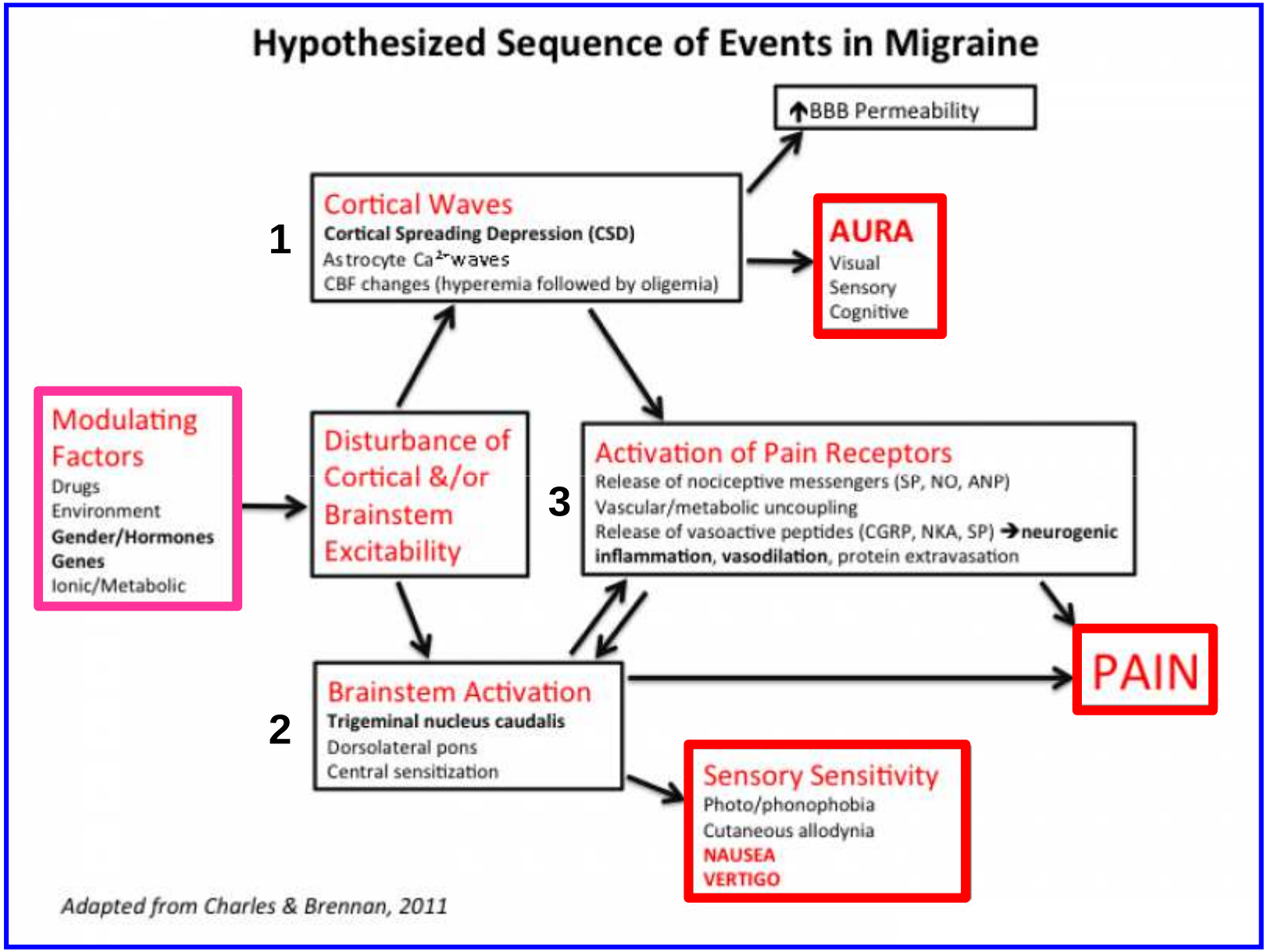
- Vital signs (always first …)
- Gait assessment
- Fundus oculi examination
- Facial symmetry
- Head and Neck structures
- Deep tendon reflexes
- Plantar response
- Limb strength

Differential Diagnosis of Headache

1. Migraine Headache

Etiology:

- Hereditary component
- Not correlated with personality or neuroses
- The worsening or migraine that occurs during periods of intense nervousness, anxiety, and depression may be due to the superimposition of a tension headache (TH)
- **Vascular vasodilatation and inflammation**

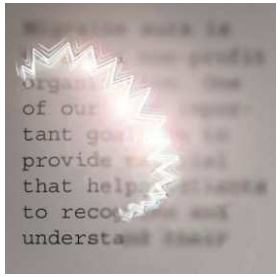

Hypothesized Sequence of Events in Migraine
↑BBB Permeability
1
Cortical Waves
Cortical Spreading Depression (CSD)
Astrocyte Ca2+ waves
CBF changes (hyperemia followed by oligemia)
AURA
Visual
Sensory
Cognitive
Modulating Factors
Drugs
Environment
Gender/Hormones
Genes
Ionic/Metabolic
Disturbance of Cortical &/or Brainstem Excitability
3
Activation of Pain Receptors
Release of nociceptive messengers (SP, NO, ANP)
Vascular/metabolic uncoupling
Release of vasoactive peptides (CGRP, NKA, SP) → neurogenic inflammation, vasodilation, protein extravasation
PAIN
2
Brainstem Activation
Trigeminal nucleus caudalis
Dorsolateral pons
Central sensitization
Sensory Sensitivity
Photo/phonophobia
Cutaneous allodynia
NAUSEA
VERTIGO
Adapted from Charles & Brennan, 2011

Migraine: Signs & Symptoms

Classic Migraine

- Character: throbbing pain (lancinante)
- Location: hemi cranial
- Associations: preceded by visual disturbances and less often with hemi-sensory disturbances, hemiparesis, or aphasia

Negative scotoma, loss of awareness of local structures



Enhancements reminiscent of a zigzag fort structure

Mostly one side loss of perception

Positive scotoma, local perception of additional structures

Migraine: Signs & Symptoms

Classic Migraine

- Associated: photophobia and or phonophobia; tension headache may be concomitant
- Aggravated by: red wine, nuts, aged cheese, (glutamate)
- Risk factor: women are more affected than men

MIGRAINE DIAGNOSTIC CONSIDERATIONS

No single criterion necessary nor sufficient for diagnosis

Up to 1/3 of patients have a neurological aura

IHS criteria do not require GI symptoms

Vomiting occurs in <1/3 of patients

41% of migraine patients report bilateral pain

50% of the time, pain is nonpulsating

Recurring moderate-to-severe headache is migraine until proven otherwise

Russell MB, et al. *Cephalalgia*.
Pryse-Phillips WEM, et al. *Can Med Assoc J*.

MIGRAINE
ADDITIONAL FEATURES

- Predictable timing around menstruation (or ovulation)
- Stereotyped premonitory symptoms
- Characteristic triggers
- Abatement with sleep
- Positive family history
- Childhood precursors (motion sickness, episodic vomiting, episodic vertigo)
- Osmophobia

Pryse-Phillips WEM et al. *Can Med Assoc J.*

DIAGNOSING MIGRAINE IN PATIENTS COMPLAINING OF HEADACHE

Strongest predictors of migraine diagnosis

Nausea

Are you nauseated or sick to your stomach when you have a headache?

Disability

Has a headache limited your activities for a day or more in the last 3 months?

Photophobia

Does light bother you when you have a headache?

2 out of 3 symptoms: PPV 93%

3 out of 3 symptoms: PPV 98%

Lipton RB et al. *Neurology*.

Factors That May Trigger Migraine

Certain influences can lead to a migraine attack. It is important to note that although a single trigger may provoke the onset of a migraine, a combination of factors is much more likely to set off an attack.

Environmental:

- Temperature (exposure to heat/cold)
- Bright lights or glare
- Noise
- Head or neck injury
- Weather changes
- Motion
- Odors (smoke, perfume)
- Flying/high altitude
- Physical strain

Lifestyle Habits:

- Chronic high levels of stress
- Skipping meals and/or poor diet
- Disturbed sleep patterns
- Smoking

Hormonal:

- Puberty
- Menopause
- Menstruation or ovulation
- Pregnancy
- Using oral contraceptives or estrogen therapy

Emotional:

- Anxiety
- Depression
- Anger (including repressed anger)
- Excitement or exhilaration
- "Let-down" response

Medications:

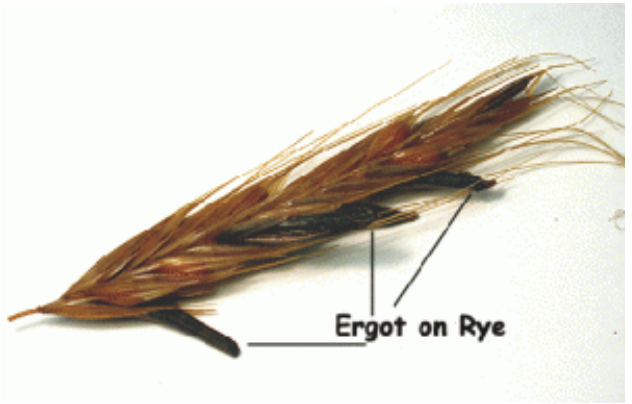
- Nitroglycerin
- Nifedipine
- Oral contraceptives
- Hormone therapy

Migraine: Treatment

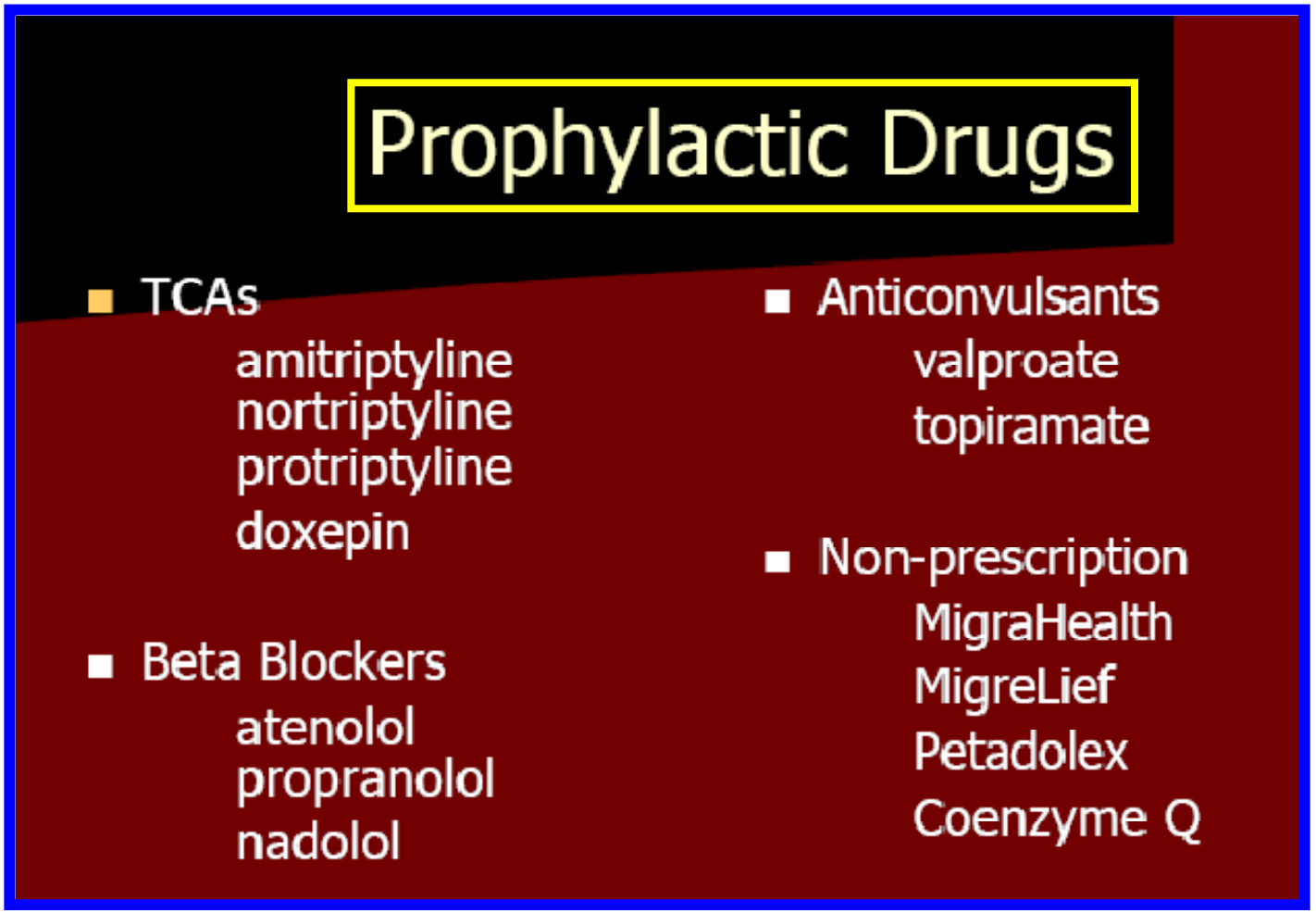
Historically: response to **Ergot therapy**

Drug treatment has widely varied in time:

- *Caffeine (Cafergot: caffeine + ergotamine)*
- *NSAIDS (e.g. ketorolac, naprossen, ibuprofen, etc.)*
- *Barbiturates (old)*



Migraine: Treatment



Migraine: Treatment

Abortive Medications

- NSAIDS (naproxyn sodium 550 mg)
- Acetaminophen
- Combination agents (Midrin; butalbital?)
- ASA + metoclopromide
- Ergotamine tartrate plus prochlorperazine
- Triptans ←

Migraine: Treatment

Tryptanes (serotonin agonists)

- Abortive drugs, not used for prophylaxis
- Oral nasal, spray
- Not to be associated with SSRI; not in CHD, PAD, and hypertension

- **Sumapriptan (Imigran)**
- **Zolmipriptan**
- **Rizapriptan**
- **Narapriptan**
- **Almopriptan**

ICSI Institute for Clinical Systems Improvement

Health Care Guideline

Diagnosis and Treatment of Headache

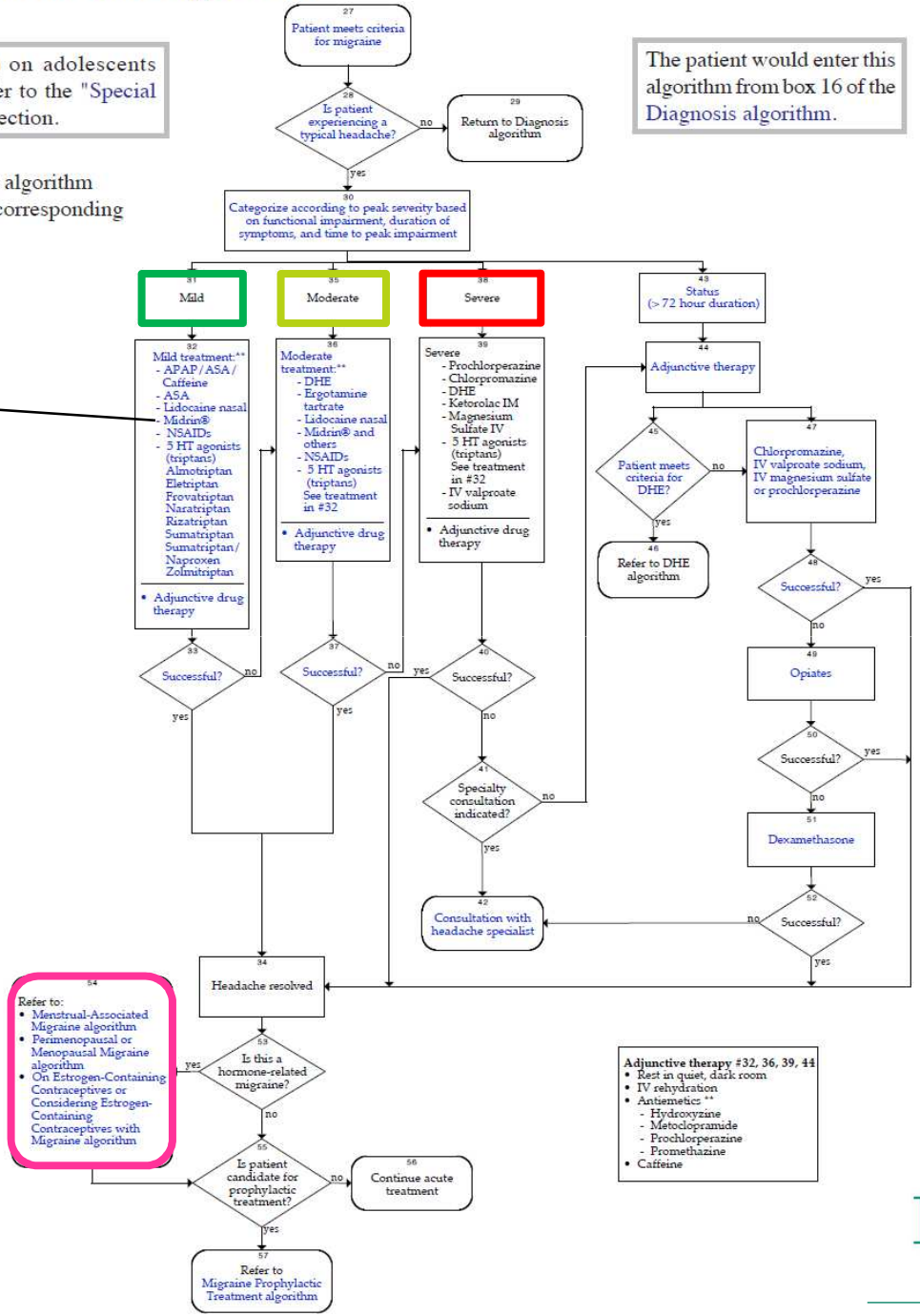
Migraine Treatment Algorithm

For information on adolescents (ages 12-17), refer to the "Special Circumstances" section.

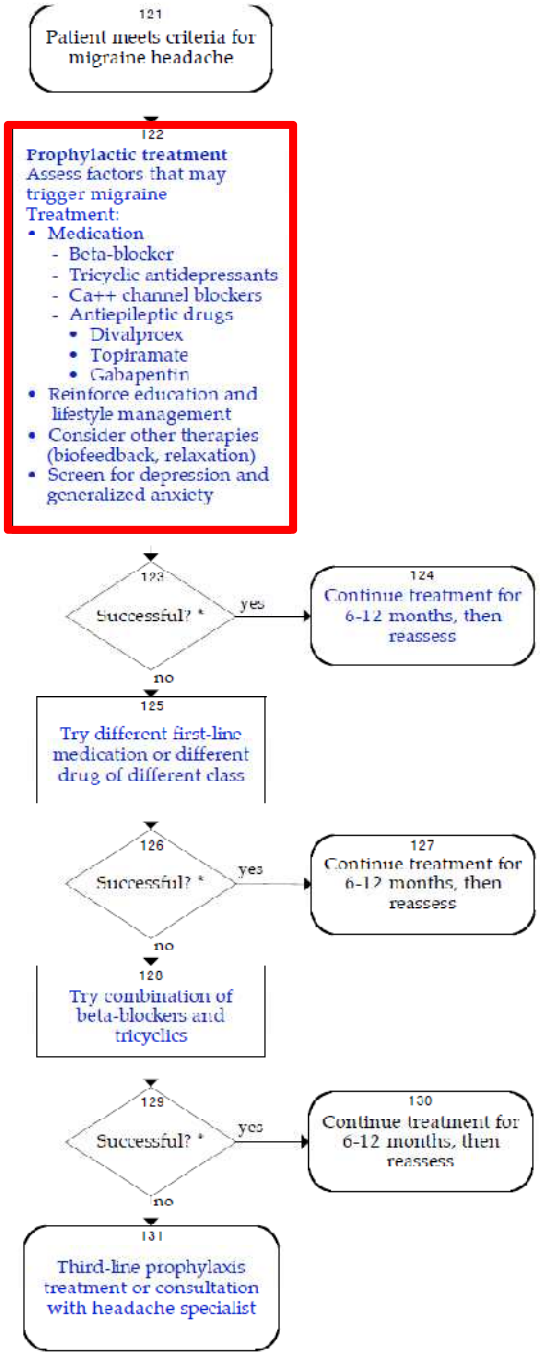
Text in blue in this algorithm indicates a linked corresponding annotation.

The patient would enter this algorithm from box 16 of the Diagnosis algorithm.

(Acetaminophen, Isometheptene Dichloralphenazone)



Migraine Prophylactic Treatment Algorithm



Text in blue in this algorithm indicates a linked corresponding annotation.

Patients enter this algorithm from box 57 of the Migraine Treatment algorithm.

*123, 126, 129. Successful? Success as determined by:
- Headaches decrease by 50% or more
- An acceptable side effect profile

2. Tension Headache

Skeletal components

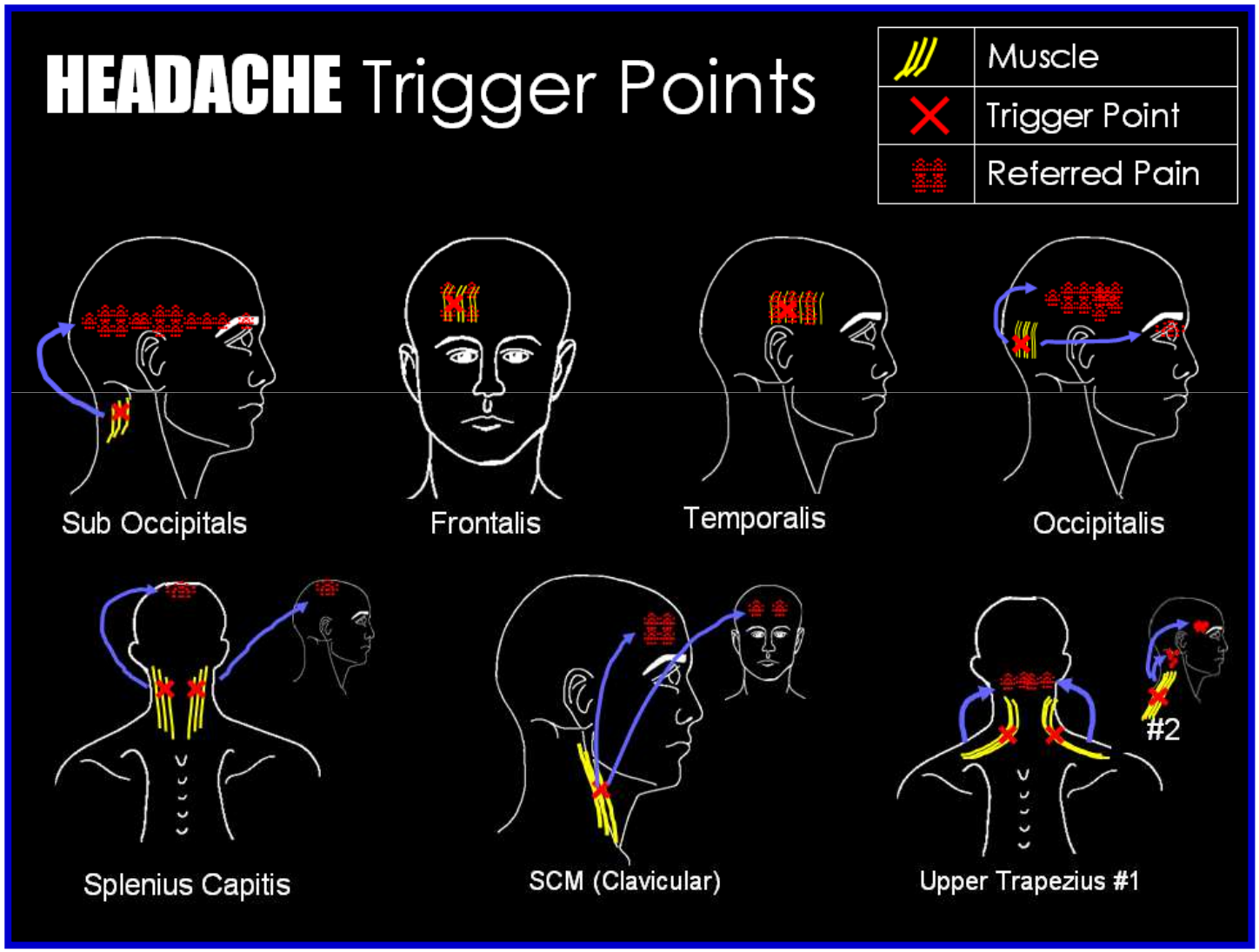
- Somatic dysfunctions of the upper cervical unit are going to impinge on the upper cervical nerves which have afferents in the cranium and dura

Tension Headache

Muscular components

- Can be explained by **Trigger Point** reflex mechanisms.
- A myofascial trigger point is a ***focus of hyperirritability*** within a taut band of skeletal muscle or the associated fascia that, when compressed, is locally tender and, if sufficiently hypersensitive, gives rise to referred pain and tenderness, and sometimes to referred autonomic phenomena and distortion of proprioception

Tension Headache



Tension Headache: Signs & Symptoms

- Pain associated with stress and muscle contraction
- May be chronic !
- Risk factors for TH are: ***Female gender,*** *Depression, Anxiety, Teeth clenching or grinding, Sleep apnea, Medications, Sleep disruption, Low physical activity, Being overweight, and Smoking*

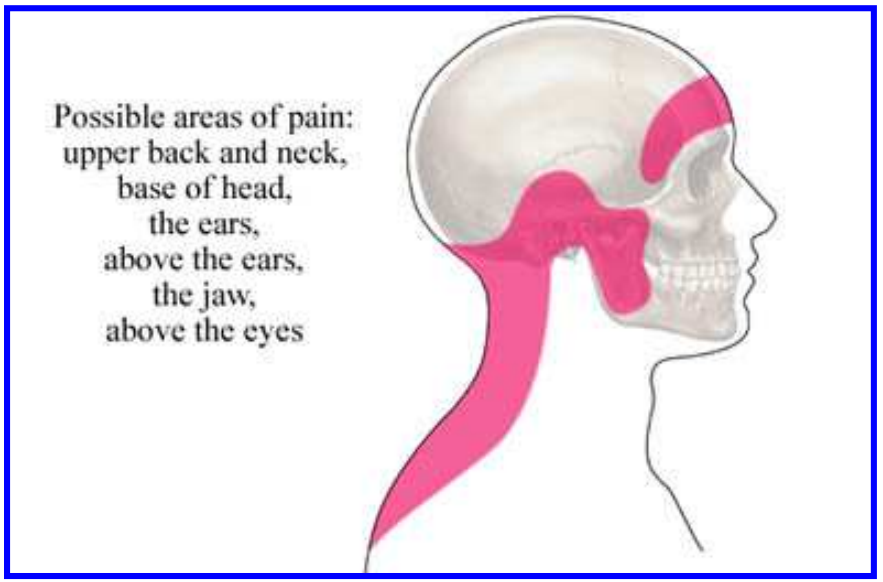
Tension Headache: Signs & Symptoms

- Constant, steady pain and pressure
- Dull and achy pain (sordo)
- Pain felt on both sides of the head, in the forehead, temples, and the back of the head
- Pressure may feel like a tight band around the head
- Intensity ranges from mild to severe and can vary during the day
- Tightness in head and neck muscles (oppressione)

Tension Headache: Treatment

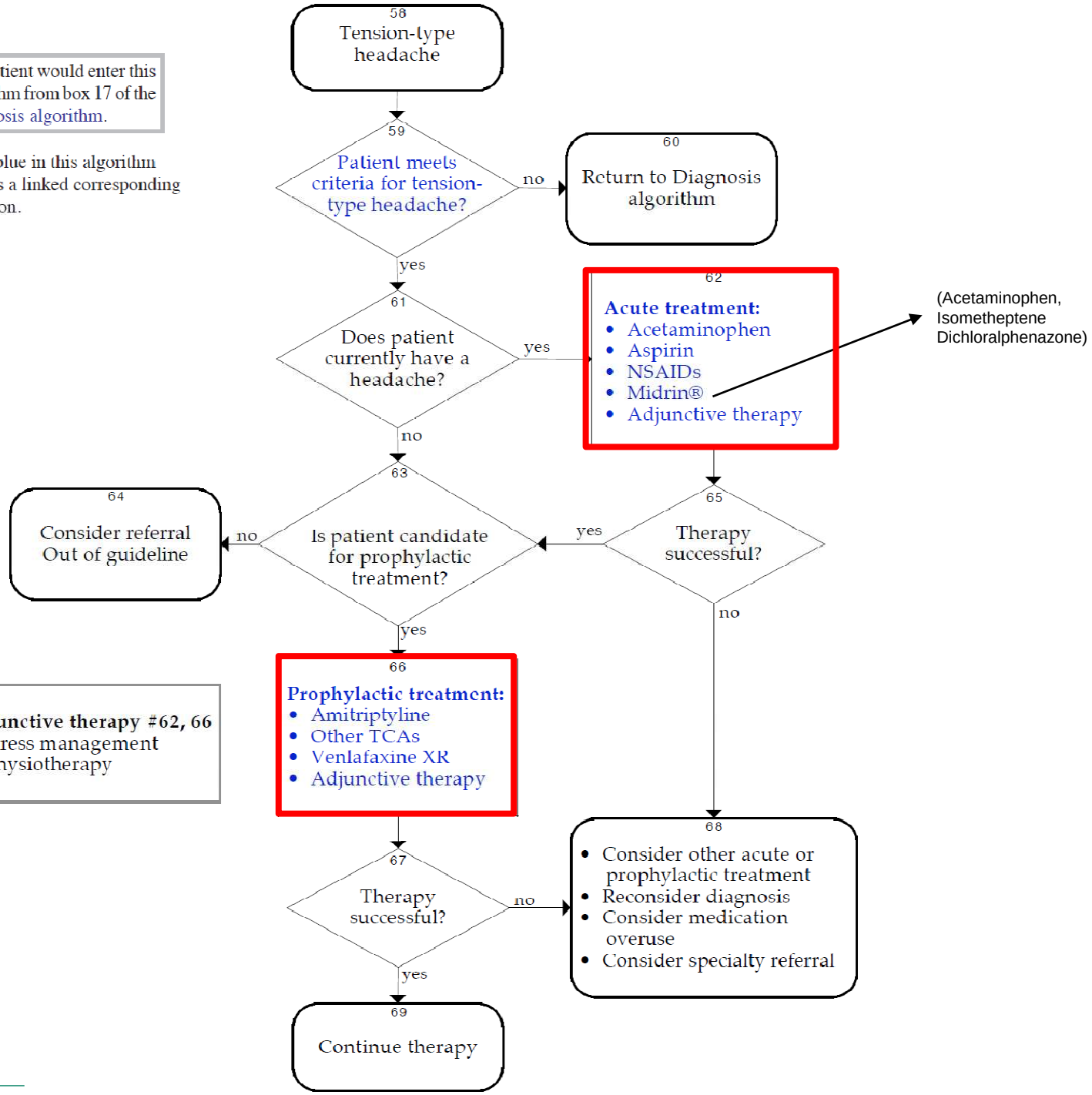
Continuous use of OTC (“over-the-count”) medications may create ***rebound pain*** when stop taking the drug.
Pain medications are most effective when taken at the first sign of pain and before it becomes severe:

- **Paracetamol**
- **NSAIDs or muscle relaxants**
- **Antidepressant medications**
- **Botulinum toxin injections**



The patient would enter this algorithm from box 17 of the Diagnosis algorithm.

Text in blue in this algorithm indicates a linked corresponding annotation.



Migraine vs Tension Headache

Migraine

≥5 attacks lasting 4 to 72 hours

≥2 of the following 4

- Unilateral
- Pulsating
- Moderate or severe intensity
- Aggravation by routine physical activity

≥1 of the following

- Nausea and / or vomiting
- Photophobia and phonophobia

Not attributable to another disorder

Tension-type

≥10 attacks lasting 30 minutes to

7 days

≥2 of the following 4

- Bilateral
- Not pulsating
- Mild or moderate intensity
- Not aggravated by routine physical activity

No nausea or vomiting

One or neither photophobia or phonophobia

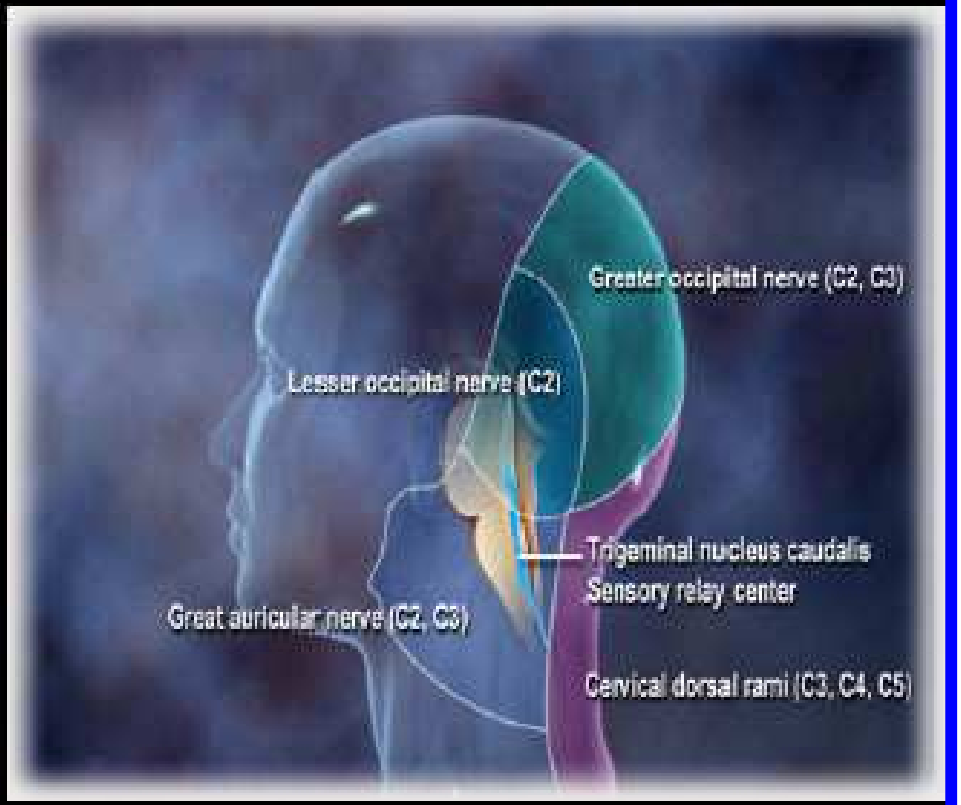
Not attributable to another disorder

Migraine mistaken for Tension Headache

Neck pain is very common during migraine attacks (75%)

Stress is a common migraine trigger

Migraine headache is often bilateral



Migraine mistaken for acute sinusitis

Pain is often located over the sinuses

Migraine is frequently triggered by weather changes

Tearing and nasal congestion common during attacks

Sinus medication may help migraine

Migraine Aura vs TIA

Migraine	TIA
Positive visual symptoms	Visual loss
Gradual onset / evolution	Abrupt
Sequential progression	Simultaneous occurrence
Repetitive attacks of identical nature	
Flurry of attacks mid-life	
Duration up to 60 minutes	Duration <15 minutes
Headache follows ~ 50%	Headache uncommon accompaniment

Fisher CM. *Stroke.*

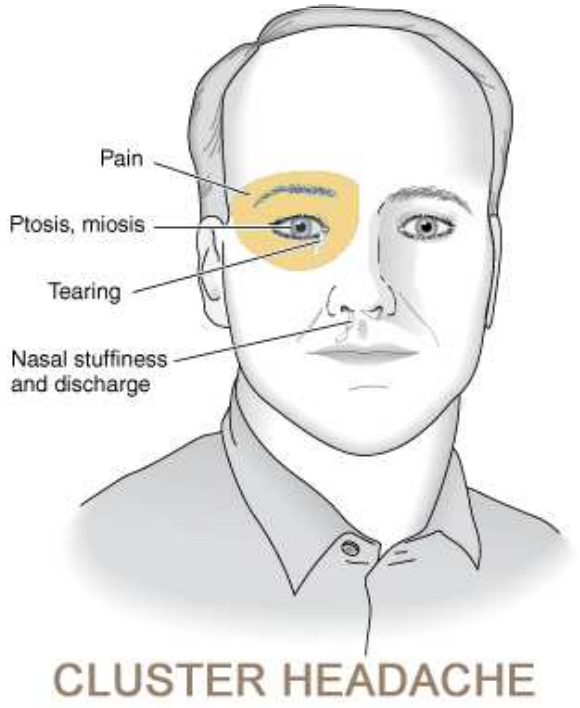
3. Cluster Headache

Etiology

- The cause is unknown
- Trigeminal autonomic cephalgias
- Risk factors: smoking, family history, and male gender
- Drinking and TNT may precipitate headache
- Diagnosis based on symptoms
- 0.1 % of population

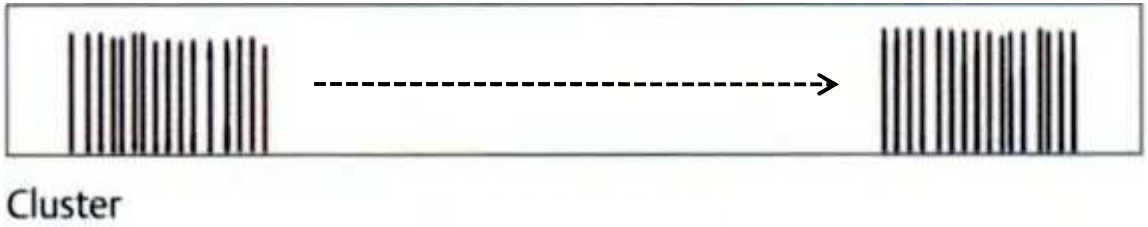
Cluster Headache: Signs & Symptoms

- Character: excruciating pain often stabbing (straziante, lancinante)
- Location: usually near one eye
- Associated: tearing, flushed face, nasal congestion, conjunctival congestion
- Onset: begins at 20-40 years of age

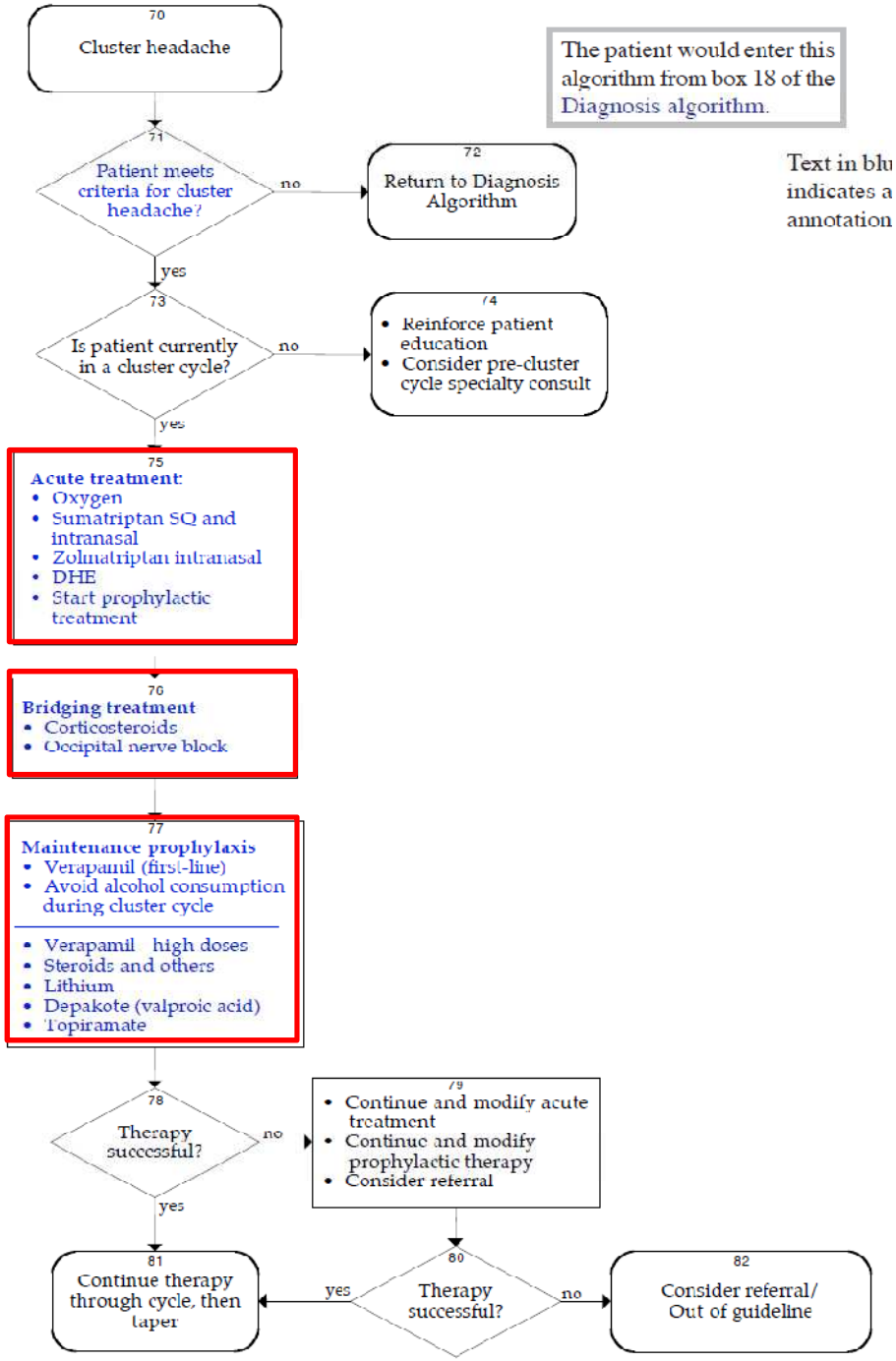


Cluster Headache: Signs & Symptoms

- Attacks last 30-90 minutes daily for days and then disappear for months (so called headache “vacation”)
- Alcohol can precipitate, but only during an active cycle, not during “vacations”
- Some are so painful that they can lead to suicide !!



Cluster Headache Algorithm



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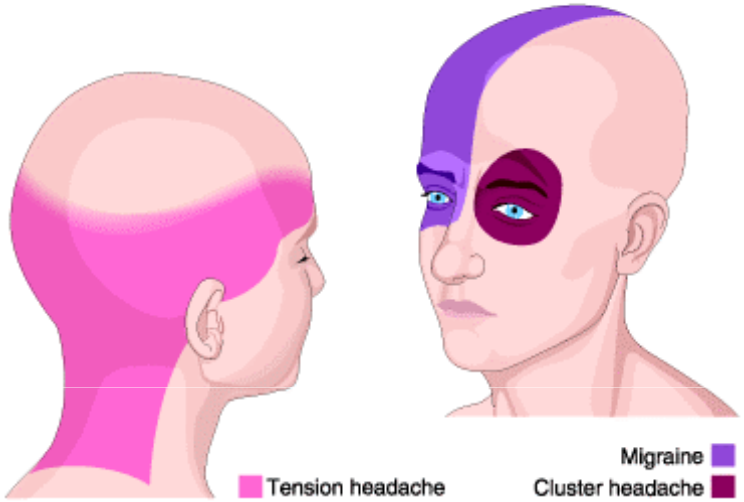
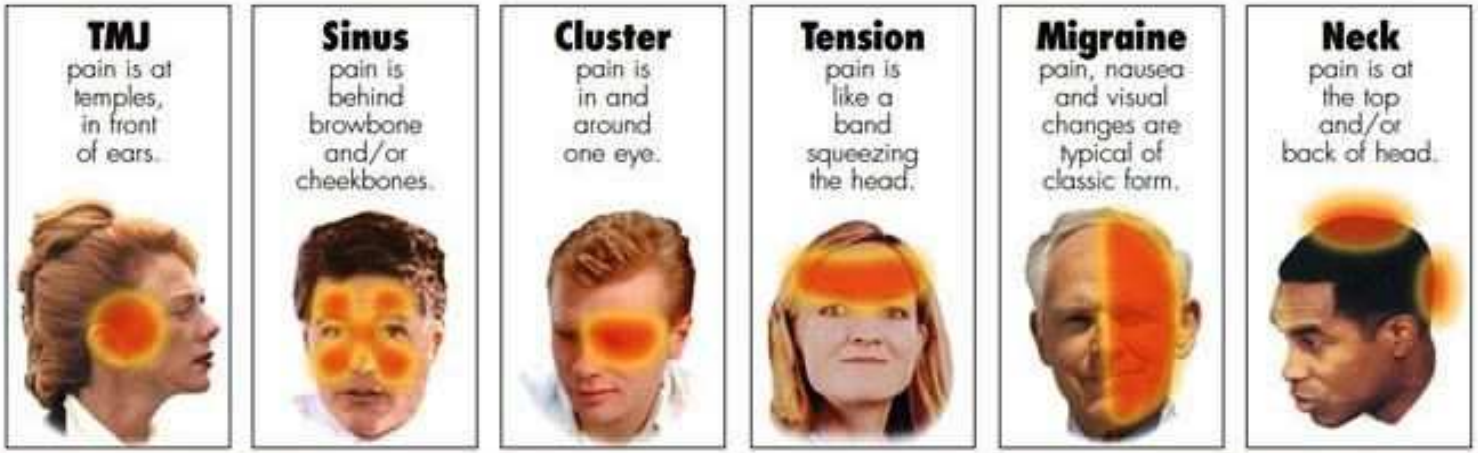
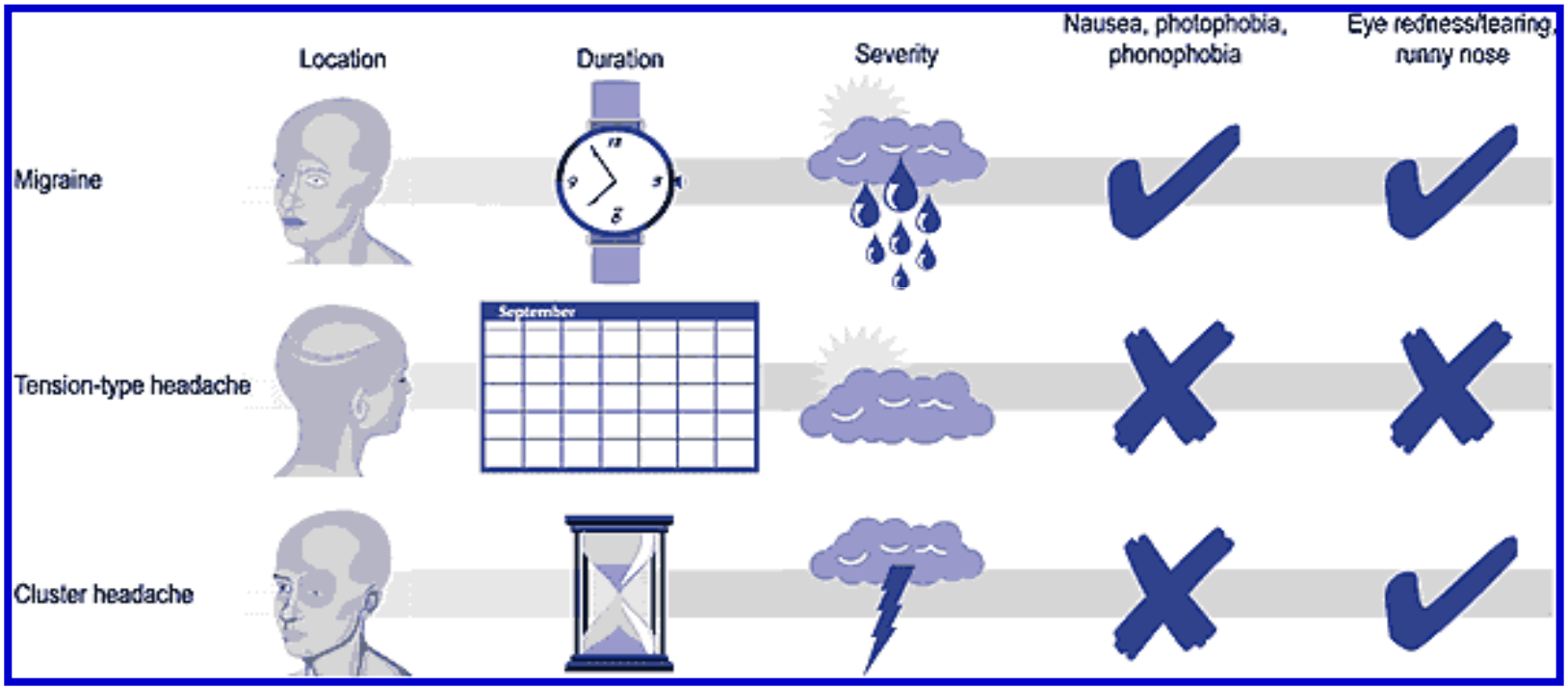
Summary of Headache Locations





Summary of principal headaches



CT scan and MRI in Headache

In patients with recurrent migraine, neither CT nor MRI is warranted except in cases with:

- Recent substantial change in headache pattern
- History of seizures
- Focal neurologic symptoms or signs

Role of CT or MRI in patients with nonmigraine headache is unclear

Consensus expert opinion

- MRI is more sensitive

Report of Quality Standards Subcommittee of AAN. *Neurology*. 1994.
Silberstein. *Neurology*.

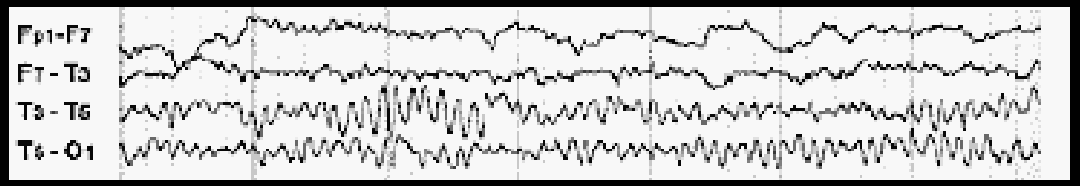
EEG in Headache

EEG is not useful in

- Routine evaluation of headache to exclude structural cause

EEG may be useful in

- Alteration or loss of consciousness
- Residual focal defects or encephalopathy
- Atypical migrainous aura



Report of Quality Standards Subcommittee of AAN. *Neurology*.

4. Hypertension

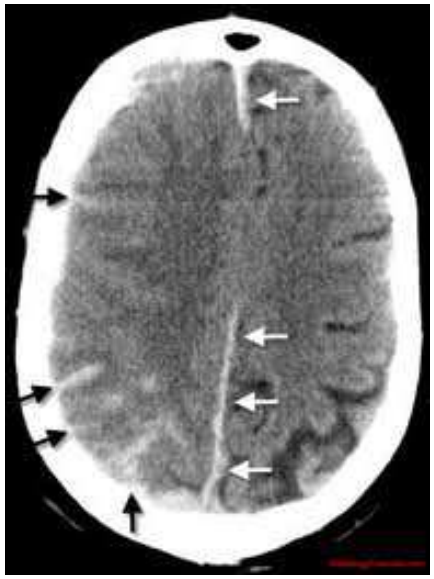
- Usually no HA's until DBP > 120 mm Hg
- 3 major causes of acute severe hypertension are: pheochromocytoma, neurogenic, drugs
- Associated findings may include: retinopathy, convulsions, confusion or stupor evolving over several days

Differential Diagnosis: Headache of organic origin

Subarachnoid hemorrhage (SAH)

Etiology

- Rupture of arterial aneurysm
- Arteriovenous malformation
- Trauma of head



Subarachnoid hemorrhage

Signs & Symptoms

- Character: catastrophic headache
- Location: holocranial
- Duration: continuous
- Associated with: photophobia, retinal hemorrhages, nuchal rigidity, Brudzinski's sign and/or Kernig's sign *(meningism),* obtunded, collapse

Subarachnoid hemorrhage

Hunt and Hess Classification of subarachnoid hemorrhage

Grade 1: Asymptomatic, mild headache, slight nuchal rigidity

Grade 2: Moderate to severe headache, nuchal rigidity , no neurologic deficit other than cranial nerve palsy

Grade 3: Drowsiness / confusion, mild focal neurologic deficit

Grade 4: Stupor, moderate-severe hemiparesis

Grade 5: Coma, decerebrate posturing

Subarachnoid hemorrhage

Diagnosis

- CT may show blood and aneurysm
- Lumbar puncture may show bloody CSF
- MRI

Meningitis

Septic Meningitis: common causes

Age	Causes
Neonates	Group B Streptococci, *Escherichia coli*, *Listeria monocytogenes*
Infants	Neisseria meningitidis, Haemophilus influenzae, Streptococcus pneumoniae
Children	*N. meningitidis*, *S. pneumoniae*
Adults	*S. pneumoniae*, *N. meningitidis*, Mycobacteria, Cryptococci

Meningitis

Signs & Symptoms

- Character: cephalgia is intense, steady, and deep
- Location: holocranial pain associated with retro-orbital pain which is aggravated with eye movement
- Onset: sub-acute or acute
- Associated: ***fever, generalized convulsions, varied levels of consciousness, nuchal rigidity, Brudzinski and Kernig's signs***

COMMON SYMPTOMS OF MENINGITIS & SEPTICAEMIA

BABIES & TODDLERS

CHILDREN & ADULTS

Meningitis

Severe stiffness of the hamstrings causes an inability to straighten the leg when the hip is flexed to 90 degrees.

Severe neck stiffness causes a patient's hips and knees to flex when the neck is flexed.

Meningitis

Diagnosis

- ***Headache with fever and/or nuchal rigidity and/or altered levels of consciousness***
- CT scan to rule out brain abscess and subdural empyema
- Lumbar Puncture:

reveals pleocytosis, increased protein, and low glucose

	Normal	Bacterial	Viral	Fungal/TB
Pressure (cmH20)	5-20	> 30	Normal or mildly increased	
Appearance	Normal	Turbid	Clear	Fibrin web
Protein (g/L)	0.18-0.45	> 1	< 1	0.1-0.5
Glucose (mmol/L)	2.5-3.5	<2.2	Normal	1.6-2.5
Gram stain	Normal	60-90% Positive	Normal	
Glucose - CSF:Serum Ratio	0.6	< 0.4	> 0.6	< 0.4
WCC	< 3	> 500	< 1000	100-500
Other		90% PMN	Monocytes 10% have >90% PMN 30% have >50% PMN	Monocytes

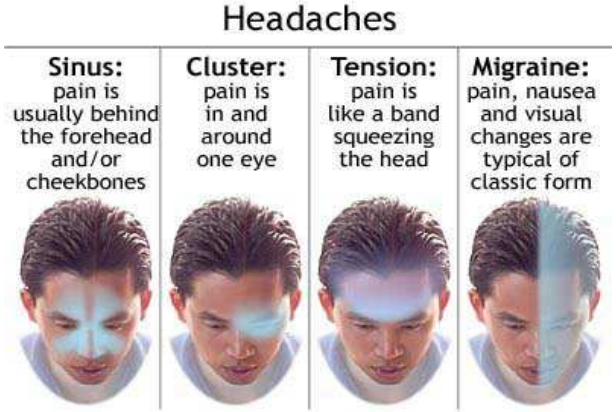
TABLE 11 Guidelines for Treatment of Bacterial Meningitis in Adults

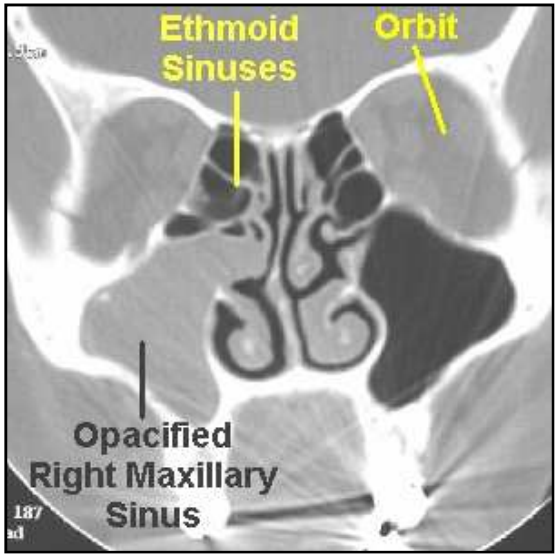
Clinical Setting	Empiric Therapy	Likely Pathogens	Directed Therapy	Usual Duration
Community[1]	Vancomycin + ceftriaxone[2]	Pneumococcus Meningococcus *Haemophilus influenzae*	Penicillin G[3] Penicillin G Ceftriaxone[2,4]	2 wk 1-2 wk 1-2 wk
Immunocompromised or age >50 years	Ceftriaxone[2] + vancomycin + ampicillin	*Listeria* sp GNB (*Pseudomonas aeruginosa*) Pneumococcus	Ampicillin + gentamicin Cefepime[6] + gentamicin[7] Penicillin G[3]	2-3 wk[5]
Postneurosurgical/ posttraumatic	Vancomycin + cefepime[6]	*Staphylococcus epidermidis* *Staphylococcus aureus* GNB (*Pseudomonas aeruginosa*) Pneumococcus	Vancomycin[8] Oxacillin[9] Cefepime[6] + gentamicin[7] Penicillin G[3]	2-4 wk

1 If age >50 years or immunocompromised, consider *Listeria* and add ampicillin.
2 Ceftriaxone 2 g IV q12h.
3 Substitute ceftriaxone or vancomycin if isolate is resistant to penicillin.
4 If isolate is β–lactamase-negative, ampicillin may be substituted.
5 Three weeks recommended for GNB.
6 Cefepime 2 g IV q8h (renal dose adjustment necessary).
7 Substitute tobramycin if resistant to gentamicin.
8 Substitute oxacillin if susceptible.
9 Substitute vancomycin if oxacillin-resistant.

Acute purulent sinusitis

- Involving the frontal, maxillary, sphenoidal, or ethmoidal sinuses
- **True “sinus HA” is rare;** if present, the patient is usually very ill, with a severe localized HA for hours or days, post nasal drip & tender sinuses
- Often misdiagnosed as tension HA or common migraine but may havethese as concomitant HA
- Diagnosis: CT scan





Temporal Giant cells Arteritis

Signs & Symptoms

- Character: throbbing and sharp, burning pain
- Location: ***headache in the temporal or frontal-occipital region***
- Onset: gradual and progressive
- Aggravated: headache *worse at night* and with cold
- Risk: most common in ***females > 50 years old***
- Associated: ***weight loss, fever, fatigue, polymyalgia rheumatica, monocular visual loss, jaw claudication***

Temporal Giant cells Arteritis

Diagnosis of Temporal arteritis

- Increased BSR - CRP
- Biopsy of temporal artery

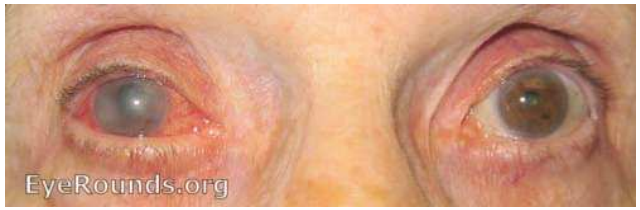
Acute angle closure glaucoma: Signs and symptoms

Symptoms include:

- **Severe pain**
- **Headache**
- **Nausea and vomiting**
- Blurred vision
- Halos around lights
- **Conjunctival injection**

Signs include:

- Ciliary flush
- Corneal edema
- Fixed mid-dilated pupil
- Shallow anterior chamber
- Elevated IOP
- Sometimes glaukomflecken
- The angle is observed to be closed on gonioscopic examination



Canadian Ophthalmological Society / Société canadienne d'ophtalmologie

Canadian Ophthalmological Society evidence-based clinical practice guidelines for the management of glaucoma in the adult eye. *Can J Ophthalmol* 2009;44(Suppl 1):S1–S93.

SUDDEN-ONSET HEADACHE

Primary

Primary thunderclap headache (TCH)

Sexual headache

Exertional headache

Cough headache

Secondary

SAH

Venous sinus thrombosis

Pituitary apoplexy

Arterial dissection

Meningoencephalitis

Acute hydrocephalus

Hypertensive crisis

Spontaneous intracranial hypotension

Dodick DW. JNNP

Exertional Headaches

• Group of headache syndromes associated with physical activity. These headaches typically become severe quickly after a strenuous activity. EH can, in some instances, be a sign of abnormalities in the brain or other diseases.

• Activities that can precipitate EH include: **running, coughing, sneezing, sexual intercourse, weight lifting, and straining with bowel movements.**

• Anyone who develops a severe headache following these types of exertion should be checked to rule out underlying organic cause. Tests may include brain MRI of brain

• **Most EH are benign.** Although these may occur in isolation, they are most commonly associated with patients who have inherited susceptibility to migraine.

• Benign exertional headaches respond to usual headache therapy. Some are particularly responsive to NSAIDs (Indomethacin, Rofecoxib, Aspirin)