Classification and Diagnosis of Secondary Headaches, Part II-Altered Intracerebral Pressure, Neoplasms, and Infections

Lawrence C. Newman, M.D.
Director, The Headache Institute
Roosevelt Hospital Center
New York, N.Y.

7. Headache attributed to non-vascular intracranial disorder

7.1 Headache attributed to high cerebrospinal fluid pressure
7.2 Headache attributed to low cerebrospinal fluid pressure
7.3 Headache attributed to non-infectious inflammatory disease
7.4 Headache attributed to intracranial neoplasm
7.5 Headache attributed to intrathecal injection
7.6 Headache attributed to epileptic seizure
7.7 Headache attributed to Chiari malformation type I
7.8 Syndrome of transient Headache and Neurological Deficits with cerebrospinal fluid Lymphocytosis (HaNDL)
7.9 Headache attributed to other non-vascular intracranial disorder

Headaches attributed to alterations in CSF pressure:

• Headache frequently accompanies alteration of CSF pressure, either high or low
• Pressure alterations may be the result of disruptions of CSF production, flow, or absorption
• Major source of CSF is choroid plexus; some also formed extra-choroidal
• CSF absorbed primarily in pachionian granulations arachnoid villi and vessels of subarachnoid space over hemispheres

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**Increased Intracranial Pressure:**

*Secondary Causes*

- Venous sinus occlusion
- Radical neck dissection
- Hypoparathyroidism
- Pseudohypoparathyroidism
- Hyperthyroidism
- Hypothyroidism
- Cushing's disease
- Addison's disease
- Polycystic ovary syndrome
- Hypervitaminosis A
- SLE
- Renal disease
- Medications (naladixic acid, danocrine, indomethacin, anabolic steroids, steroid withdrawal, tetracyclines)
- Mass lesions
- Meningitis/encephalitis
- Lyme
- HIV
- Postchildhood varicella
- Anemia
- Polycythemia
- Trauma
- Hydrocephalus

**Headaches attributed to alterations in CSF pressure:**

- Rate of CSF formation is 0.37 ml/min = 500ml/day
- Total CSF volume renewed every 6-8 hours
- Average CSF pressure is 150 mm H2O (range is 70-200) in lateral recumbent position
- Pressures below 60 mm H2O symptoms of intracranial hypotension
- Pressures above 200 in non-obese and 250 in obese are symptomatic
- Monroe-Kellie doctrine: Any increase in intracranial volume leads to increased ICP

**Headache attributed to Idiopathic Intracranial Hypertension (IIH):**

- Predominantly in obese females of childbearing age
- Postulated that the decreased rate of absorption and increase in edema are the major factors
- Resembles tension-type headache.
- Usually daily and continuous (CDH-like)
- Present upon awakening
- Aggravated by coughing or straining
Headache attributed to Idiopathic Intracranial Hypertension (IIH):

- Transient visual obscurations 71%
- Pulsatile tinnitus
- Diplopia 38%
- Visual loss 31%
- Shoulder/arm pain
- Nausea 57%; Vomiting 38%

IIH Clinical Findings:

- VIth nerve palsy
- Papilledema (not necessary) Possible association with prior head trauma or meningitis
- Enlarged blind spot
- Visual field defects
- Cranial bruit: Pulse synchronous heard best over mastoid or temporalis with mouth open; stops with carotid compression

7.1.1 Headache attributed to IIH

A. Progressive headache with ≥1 of the following characteristics and fulfilling criteria C and D:
   1. daily occurrence
   2. diffuse and/or constant (non-pulsating) pain
   3. aggravated by coughing or straining
B. Intracranial hypertension (criteria on next slide)
C. Headache develops in close temporal relation to increased intracranial pressure
D. Headache improves after withdrawal of CSF to reduce pressure to 120-170 mm H₂O and resolves within 72 h of persistent normalisation of intracranial pressure

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7.1.1 Headache attributed to IIH

B. Intracranial hypertension fulfilling the following criteria:
   1. alert patient with neurological examination that either is normal or
en          demonstrates any of the following abnormalities:
            a) papilloedema
            b) enlarged blind spot
            c) visual field defect (progressive if untreated)
            d) sixth nerve palsy
   2. increased CSF pressure (>200 mm H₂O [non-obese], >250 mm
      H₂O [obese]) measured by lumbar puncture in the recumbent
      position or by epidural or intraventricular pressure monitoring
   3. normal CSF chemistry (low CSF protein acceptable) and cellularity
   4. intracranial diseases (including venous sinus thrombosis) ruled out
      by appropriate investigations
   5. no metabolic, toxic or hormonal cause of intracranial hypertension

Headaches attributed to low CSF pressure:

- Intracranial hypotension may be spontaneous or
  may be symptomatic; the most common cause is
  following a lumbar puncture
- Low pressure syndromes may also follow trauma
  or surgery to the head or back; they may or may
  not have an associated leak.
- Low CSF pressure may result from CSF
  rhinorrhea or systemic illness.

Causes of low pressure headache:

- Spontaneous (post-coital coded here now)
- Symptomatic
- LP
- Traumatic Head or Back
  - With leak (dural tear, traumatic root avulsion)
  - Without leak
- Post-op: Craniectomy, spinal, pneumonectomy
  - With or without leak
- Spontaneous leak: Rhinorrhea, occult pituitary tumor, dural tear
- Systemic illness: Dehydration, diabetic coma, meningoccephalitis,
  uremia, severe infections
- Infusions of hypertonic solutions
- CSF shunts
Low-CSF pressure headaches:

- The clinical features of low-CSF pressure headaches are similar despite the etiology
- In general the pain is worsened by being upright, shaking the head and jugular compression and lessens or disappears with recumbency
- The longer the patient remains upright the longer it takes for the headache to resolve after lying down

Low-CSF pressure headache:

- Frontal, occipital or diffuse
- Severe, dull or throbbing
- Worsened with head shaking, coughing, sneezing, jugular compression
- Worsened by being upright; relieved with recumbancy
- NOTE: ICHD-II does not describe the headache post LP or with CSF fistula; for spontaneous low CSF pressure headache described as diffuse or dull.
- Associated Features:
  - Neck stiffness
  - Tinnitus
  - Hyperacusis
  - Photophobia
  - Nausea

Low-CSF pressure headaches: MRI

- Diffuse pachymeningeal enhancement
- Descent of brain (cerebellar tonsils, obliteration of prepontine or perichaismatic cisterns, post fossa crowding)
- Pituitary enlargement
- Flattening of optic chiasm
- Subdural collections
- Engorged venous sinuses
- Small ventricles

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**Diffuse Pachymeningeal Enhancement**

**Important Facts about ICHD-II criteria for low CSF pressure headaches:**

- Headache worsens within 15 mins after standing/sitting for all 3 types
- Associated features same for all types
- Only spontaneous form has headache description
- No CSF leak or LP needed for post LP dx
- Headache resolves at different times for different conditions
- Post LP: spontaneously within 1 week or within 48 hours of patch
- Spontaneous form; within 72 hours of patch
- CSF fistula; resolves within 7 days of fixing leak
7.2.1 Post-dural (post-lumbar) puncture headache

A. Headache that worsens within 15 min after sitting or standing and improves within 15 min after lying, with ≥1 of the following and fulfilling criteria C and D:
1. neck stiffness; 2. tinnitus; 3. hypacusia; 4. photophobia; 5. nausea
B. Dural puncture has been performed
C. Headache develops within 5 d after dural puncture
D. Headache resolves either:
1. spontaneously within 1 wk
2. within 48 h after effective treatment of the spinal fluid leak

Headache attributed to aseptic (non-infectious) meningitis:

- Associated with the use of
  - ibuprofen
  - immunoglobulins
  - penicillin
  - trimethoprim
  - intrathecal injections or insufflations
- CSF shows lymphocytic pleocytosis, mildly elevated protein, normal glucose and no organisms
- Headache resolves within 3 months of withdrawal

Headache Associated with Intracranial Neoplasm

- Headache is a common manifestation of brain tumors; it occurs at presentation in about half of patients and develops during the course of the disease in ~60%.
- Headaches are rare initially with pituitary tumors, craniopharyngiomas or tumors of the CP angle.
- Headaches are common as initial complaints in patients with infratentorial tumors.
- Supratentorial tumors may impinge upon V1 innervated structures and will cause pain fronto-temporally.
- Tumors in the posterior fossa compress IX and X and are cause pain occipito-nuchally
Intracranial Neoplasms: 2 subtypes

ICHDI-II

1- Headache attributed to increased intracranial pressure or hydrocephalus caused by neoplasm
   • Diffuse non-pulsatile headache with one of:
     • nausea/vomiting
     • worsened by activity and/or valsava
     • occurring in attack-like episodes

2- Headache attributed directly to neoplasm
   • Associated with at least one of:
     • progressive
     • localized
     • worse in AM
     • Aggravated by coughing or bending

Headache attributed to Chiari I:

• Chiari I is characterized by ≥ 5mm caudal descent of cerebellar tonsils or
  ≥ 3 mm descent plus at least one of:
    • Compression of CSF spaces posterior and lateral to cerebellum
    • Reduced height of supravciciput
    • Increased slope of tentorium
    • Kinking of medulla
• The headache associated with CM1 is similar to primary cough or valsava headaches except that they are longer in duration and are associated with brainstem, cerebellar or cervical cord dysfunction.
• Posterior fossa dysfunction seen with the headaches include at least two of:
  • otoneurological symptoms: dizziness, disequilibrium, ear pressure, hyperacusia, vertigo, down-beating nystagmus, oscillopsia
  • Transient Visual symptoms: spark photopsia, blurring, diplopia, transient field deficits
• Clinical signs referable to cervical cord, brainstem or lower CN’s, ataxia or dysmetria

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Chiari 1 Malformation

Syndrome of transient headache and neurological deficits with cerebrospinal fluid lymphocytosis (HaNDL):

- Characterized by recurrent episodes of moderate to severe headaches that either accompany or follow in short order a variety of transient neurological deficits
- Episodes usually last several hours and recur over a course of less than 3 months
- Patients are asymptomatic between episodes.

Epidemiology:
- Rare less than 100 reports
- M:F 2:3:1
- Age 30 (7-51)

HaNDL

- Temporal focal neurological symptoms
- Usually sensory plus aphasia
- Followed by moderate to severe headache
- Complete and spontaneous relief within few weeks to months
- Prodromal symptoms include malaise, cough, diarrhea, or rhinitis which may precede symptoms by 3 weeks
- Most patients experience left hemispheric dysfunction
- Symptoms last minutes to days
- Asymptomatic between attacks

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HaNDL

- Resembles migraine; throbbing, usually non-localized and bilateral
- When hemicranial-is always contralateral to neuro deficits
- The headache resolves as the CSF abnormalities begin. CSF findings include lymphocytic pleocytosis (10-760 cells), increased protein (20-250) and increased opening pressures (100-400).
- CT, MRI, microbiological studies are normal.
- EEG and SPECT may show focal abnormalities.

9. Headache attributed to infection

9.1 Headache attributed to intracranial infection
9.2 Headache attributed to systemic infection
9.3 Headache attributed to HIV/AIDS
9.4 Chronic post-infection headache

Headache attributed to HIV/AIDS:

- Headache can occur as primary manifestation of HIV acute infection
- Headache may be part of HIV meningitis or encephalitis
- Headache may result from opportunistic infection
9.1 Headache attributed to intracranial infection

9.1.1 Headache attributed to bacterial meningitis
9.1.2 Headache attributed to lymphocytic meningitis
9.1.3 Headache attributed to encephalitis
9.1.4 Headache attributed to brain abscess
9.1.5 Headache attributed to subdural empyema

Headaches attributed to intracranial infection:

• Important notes for this chapter:
  • Definitive diagnosis only when headache resolves or greatly improves after effective treatment or spontaneous remission
  • If infection can’t be effectively treated or does not spontaneously remit, or insufficient time—"probable" designation
  • Exception: with bacterial meningitis the headache may become chronic. When infection remits or is effectively treated, but headache persists after 3 months, the diagnosis becomes chronic post-bacterial meningitis headache.

Headache attributed to bacterial meningitis:

• Predisposing factors include AIDS, sickle cell, alcoholism
• Organisms:
  • Neonates- Group B strep, Listeria, E. Coli
  • Adults-Strep pneumonia, Neisseria meningitides, H flu group b strep, L monocytogenes,
  • CSF leak from skull fracture- Pneumococci, and skin flora
  • Post LP (chemo, neuro surgical procedures)- Staph aureus and coag negative staph
Headache attributed to bacterial meningitis:

- **Clinical Features:**
  - Fever, headache, stiff neck—classic triad
  - Nausea, vomiting, photophobia, lethargy
  - Seizure, altered MS (stupor)
  - Fever is most sensitive sign, followed by nuchal rigidity and MS changes

Headache attributed to bacterial meningitis:

- **Headache:**
  - Severe and unremitting
  - Generalized radiating into neck, back, and extremities
  - May be frontal only
  - ICHD says diffuse pain
  - Thuderclap headache may be first sign
  - “jolt-worsening”
  - Young children usually no headache complaint
  - Elderly have fewer headaches than adults

- **CSF:**
  - 10-10,000 wbc’s; mostly PML’s
  - Neutrophils predominate in Listeria
  - Low glucose

Headache attributed to lymphocytic meningitis:

- ICHD considers non-bacterial infections here
- May have an acute onset
- Severe headache with photophobia, fever, malaise, anorexia, stiff neck
- Changes in MS but rarely obtundation/coma
- All patients have bilateral headache (not in ICHD)
- More benign course
**Headache attributed to lymphocytic meningitis:**

- **Common Viral pathogens:**
  - Enterovirus (echo, Coxsackie’s, polio) most common
  - Mumps, arbovirus, H simplex, HIV, LCM, EBV, adenovirus
  - Causitive virus identified only 11-12%
  - CSF shows lymphocytic pleocytosis, mildly elevated protein, normal glucose
  - PCR to identify enterovirus

**Headache attributed to encephalitis:**

- Infection involving brain parenchyma
- Most cases begin summer and early fall
- Highest incidence in infancy
- M>F
- HSV most common cause, also mumps, arbovirus, LCM
- West Nile
- Except for HSV (PCR) most cases never identified

**Headache attributed to encephalitis:**

- **Clinical features:**
  - headache
  - fever
  - MS changes
  - Meningeal signs +/- Thunderclap headache may be initial manifestation
  - Prodrome of fever, malaise, myalgias up to 1 week prior

- **Lab:**
  - CSF pleocytosis; <200 pred lymps
  - RBC’s, xanthrocromia with HSV
  - EEG abnormalities, MRI findings
  - PCR

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**Lymphocytic meningitis can also be caused by:**

- Fungi
- Parameningeal infections
- Carcinomatous meningitis
- TB
- Sarcoidosis
- Lupus
- Wegners
- Bechets
- Chemical (spinal anesthesia, myelograms intrathecal injections)
- Syphilis
- Lyme

**Headache attributed to brain abscess:**

- Peak incidence in childhood and > age 60
- M>F 3:1
- Risk factors:
  - Neurosurgery
  - Penetrating brain trauma
  - Otitis media
  - Infections of sinuses, teeth, lungs, heart

**Headache attributed to brain abscess:**

- Headache is often hemicranial (Silberstein) but ICHD says bilateral
- Headache is usual presenting symptom
- Can present with a seizure
- Focal deficits, altered MS
- Nausea and vomiting often begin a week after headache onset-Increased ICP
- Less than ½ have Papilledema at presentation
Headaches attributed to subdural empyema:

- Often secondary to sinusitis or otitis media
- Pain usually unilateral or worse on one side
- May be associated scalp tenderness

8. Headache attributed to a substance or its withdrawal

8.1 Headache induced by acute substance use or exposure
8.2 Medication-overuse headache (MOH)
8.3 Headache as an adverse event attributed to chronic medication
8.4 Headache attributed to substance withdrawal

Headache induced by acute substance or exposure:

- NO donor-induced headache:
  - Typically unilateral, pulsating frontotemporal headache, worsens with activity
  - From amyl nitrate, glycerol trinitrate, isosorbide, sodium nitroprusside, nitrates or nitrites (Hot dog headache)
  - Immediate and delayed subtype; delayed occur in patients with pre-existing primary headache
- PDE headache:
  - Bilateral, frontotemporal, throbbing
  - Worsens with activity
  - Develops within 5 hours
  - Resolves within 72 hours
- Alcohol:
  - Bilateral, frontotemporal, throbbing
  - Worsens with activity
  - Immediate subtype: develops within 3 hours; resolves in 72 hours
  - Delayed: ingestion varies—moderate for migraineurs, intoxicating for non-migraineurs
- Histamine:
  - Causes immediate headache in non-headache sufferers
  - Causes immediate and delayed in migraineurs
  - Mechanism is mediated by H1 receptor; blocked by mepyramine
  - Migraine and tension-type develop after 5-6 hours; cluster after 1-2 hours
- CGRP:
  - Immediate and delayed subtypes
  - Same as histamine
Medication Overuse Headache

- Patients with a pre-existing primary headache who develop a new type of headache or whose migraine or tension-type headache is made markedly worse during medication overuse should be given both the diagnosis of the preexisting headache and the diagnosis of medication overuse headache.
- If the offending medication has not yet been withdrawn or if the overuse has ceased within the last 2 months but the headache has not yet resolved or reverted to previous pattern, use probable designation.

Medication Overuse Headache: Important Facts

- Subtypes for ergotamine, triptan, analgesic, opioid, combination meds, and combinations of above, and other
- Analgesic use ≥ 15 days month
- All others ≥ 10 days
- Headache descriptions have been eliminated in revisions