Mimicry in the blood and brain: 2 unrelated patient cases

Kurt Schmidt DO
Case 1: “Flu-like”

66yo male from home
CC: flu-like symptoms

4 days of malaise, body aches, low grade fever (Tmax 100.5°F).

No known sick contacts.

Recent travel: Eastern WI at his ‘camp’, possible tick bite

Lives in the Keweenaw peninsula of the UP.

4 (-) Covid tests.....3 rapid and 1 PCR.

Active, healthy

Context: Fall of 2022

PMH: BPH

Meds: Flomax

Allergies: NKDA

Social: (-) tobacco/smoking/vaping, EtOH, illicit

ROS: Pos:

gen fatigue
Temp 100.5
Body aches

Neg:

HEENT: (-)
Resp: (-)
CV: (-)
GI: (-)
GU: (-)
Neuro: (-)
Skin: (-)
Heme: (-)
Case 1: “Flu-like”

DDX_{1,o}

Neuro: viral meningitis?

Resp: Covid w/false negative?

   Some other resp virus?

   Pneumonia - atypical vs viral?

   No pharyngitis; no strep

CV: pericarditis/myocarditis

GI/GU: no GI /GU sx whatsoever

Heme: leukemia? Multiple myeloma?

ID: bacterial (Lyme?, Ehrlichiosis?, RMSF?) vs other
Case 1: “Flu-like”

Exam:

General:

(+) appears younger than stated age though tired. (-) nontoxic in appearance.

HEENT:

(-) no scleral icterus, no nasal discharge, oral mucosa moist and without petechiae, neck supple, no posterior pharyngeal erythema/edema, uvula midline.

Resp:

(-) Good effort. Clear to auscultation throughout, good air entry to the bilateral bases.

CV:

(-) Heart RRR, pulses equal.

GI:

(-) soft, contender, normal bowel sounds, no rigidity/guarding.

Neuro:

(-) GCS 15, no gait ataxia, answering all questions appropriately, clearly, and without hesitation.

Skin:

(-) Warm and dry. No petechiae or ecchymosis. No clubbing of fingernails.

MSK:

(-) boney deformities.
Case 1: “Flu-like”

DDX$_{2.0}$

Neuro: viral meningitis?

Resp: Covid w/false negative?
   - Some other resp virus?
   - Pneumonia - atypical vs viral?

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Heme: leukemia? Multiple myeloma?

ID: bacterial (Lyme?, Ehrlichiosis?, RMSF?) vs other (babesiosis)
# Case 1: “Flu-like”

**Labs:**

**CBC:**
- WBC 5.2
- RBC 4.10* [4.69-6.13] "inclusions present"
- Hgb 13.1. [13.5-17.5]
- Hct 38.6. [38.8-50.0]
- MCV 94.1
- MCH 32.0 [27-31.2]
- RDW 13.2
- PLT 54* [142-424] "checked: no clots/clumps/lg plt"
- %Neut 33.3 [37-80]
- %Lymph 52.8
- %Mono 12.7 [0-12]
- %Eos 0.2
- %Baso 1.0
- Abs Neut 1.7. [2-6.9]
- Abs Lymph 2.8
- Abs Eos 0.0
- Abs Baso 0.1
- Nucleated RBC 0.0

**CMP:**
- GLU 102
- BUN 19
- Cr 0.8
- eGFR >60
- Na 131. [137-145]
- K 4.3
- Cl 101
- CO2 27
- AG 3
- Ca 9.1
- Alb 4.1
- T Bili 1.5 [0.2-1.3]
- AST 88. [17-59]
- ALT 84. [0-49]
- ALK Phos 88

**UA:**
- Clear
- Protein - trace
- Glu (-)
- Ketones - trace
- Bili (-)
- Blood: 2+
- Nitrite (-)
- Leuk esterase (-)
- Squams: few
- WBC 0.2

**Other:**
- Procalcitonin 0.40
  - (Systemic infection unlikely)
- CRP 8.4. [0-1.0]
- Lyme IGG 0.04 [<0.2 = neg]
- Lyme IGM 0.09 [<0.2 = neg]

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Something is damaging the RBCs and platelets... and it is escaping the immune system.
Case 1: “Flu-like”

DDX$_{3.0}$

Neuro: viral meningitis?

Resp: Covid w/false negative?

  Some other resp virus?

  Pneumonia— atypical vs viral?

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Heme: leukemia? Multiple myeloma?

ID: bacterial (Lyme?, Ehrlichiosis?, RMSF?) vs other (babesiosis)
**Case 1: “Flu-like”**

**Lyme disease**

- **Bacteria:** *Borrelia burgdorferi*
- **Tick vector:**
  1. *Ixodes scapularis* (Black legged deer tick)
  2. *Ixodes pacificus* (Western black legged tick)
- **Sx:** "viral" + lymphadenopathy + rash
- **Dx:** suspicion +/- antibody test
  - Ab Delay —> false (-)
  - Ab Persist —> false (+)
- **Tx:** Doxy / Amox / Ceftin / Rocephin
  *only one w/prophylaxis Doxy

**Ehrlichiosis**

- **Bacterial:** *Ehrlichia spp*
- **Tick:**
  1. *Ixodes scapularis* (Black legged deer tick)
  2. *Amblyomma americanum* (Lone Star Tick)
- **Sx:** "viral" + rash(meds) + GI + confusion
- **Dx:** suspicion + early PCR + late IgG + blood smear
- **Tx:** Doxy for all

**RMSF**

- **Intracellular Bacterial:** *Rickettsia rickettsia*
- **Tick:**
  1. *Dermacentor variabilis* (American Dog tick)
  2. *Rhipicephalus sanguineus* (Brown dog tick)
  3. *Dermacentor andersoni* (Rocky Mtn wood tick)
- **Sx:** "viral" + GI + rash
- **Dx:** suspicion + early PCR + late IgG + blood smear
- **Rx:** Doxy for all

**Babesiosis**

- **Parasite:** *Babesia microti*
- **Tick vector:**
  1. *Ixodes scapularis* (Black legged deer tick)
- **Sx:** "viral" + hemolytic anemia
- **Dx:** suspicion + Blood smear
- **Rx:** Azithro + Atovaquone / Clinda + Quinidine
**Babesiosis**

**Parasite**: Babesia microti

**Tick vector**: (1) *Ixodes scapularis* (Black legged deer tick)

**Symptoms**:
- "viral" + hemolytic anemia

**Diagnosis**: suspicion + Blood smear

**Treatment**:
- Azithromycin + Atovaquone
  - Clinda + Quinidine

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**Tularemia**

**Bacterial**: Ehrlich spp

**Tick**:
- (1) *Rhipicephalus sanguines* (Brown dog tick)
- (2) *Amblyomma americanium* (Lone Star Tick)

**Additionally**:
- (3) Deer fly
- (4) inf tissue (rodent) → through skin/eye
- (5) aerosol
- (6) water (inf rodent in water)

**Symptoms**:
- "Viral" + GI + "Oculoglandular"

**Diagnosis**:
- suspicion + PCR + Direct immunofluorescence

**Laboratory Tests**:
- hemolytic anemia
- HypoNa
- Hepatic enzymes
- ESR
- Myoglobinuria

**Treatment**:
- Gent/Doxy/Cipro

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**Case 1: “Flu-like”**

- 1-4 wks after tick bite
- Asymptomatic:
  - 25% adults
  - 50% children

- Ab testing cannot distinguish new vs prior infection
Case 1: “Flu-like” Babesiosis

Parasite: Babesia microti

Tick vector: (1) Ixodes scapularis (Black legged deer tick)

Sx: “viral” + hemolytic anemia

Dx: suspicion + Blood smear (Giesma stain)

Tx: Azithro + Atovaquone, Clinda + Quinidine

RBC 4.10+ [4.69-6.13] *inclusions present

Hgb 13.4 [13.5-17.5]

Hct 38.6 [38.8-50.0]

PLT 54

Na 131

T Bili 1.5 [0.2-1.3]

AST 88 [17-59]

ALT 84 [0-49]

Urine Blood: 2+

Urine RBC 100-25

“Diagnosis is made upon seeing multiple infected red cells with extracellular ring forms on blood smear

Classical blood smear finding is a tetrad of intracellular ring forms (Maltese cross) with extracellular ring forms”
Case 1: “Flu-like”

Babesiosis

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“Diagnosis is made upon seeing multiple infected red cells with extracellular ring forms on blood smear

Classical blood smear finding is a tetrad of intracellular ring forms (Maltese cross) with extracellular ring forms”

2nd Wednesday in November:
International Pathology Day

Without pathology, there is no medicine.
International #PathologyDay
Case 1: “Flu-like”

Babesiosis

Parasite: Babesia microti

Tick vector: (I)xodes scapularis (Black legged deer tick)

Sx: “viral” + hemolytic anemia

Dx: suspicion + Blood smear (Giesma stain)

Tx: Azithro + Atovaquone

Clinda + Quinidine

Mimicry: Babesiosis = “Tick born malaria”

Malaria

Parasite: Babesia microti

Mosquito vector: Female Anopheles spp.

Sx: “viral” + hemolytic anemia

Dx: suspicion + Blood smear (Giesma stain) + RapidAntigen | PCR | ELISA/immunofluorescence

DrugResistanceTesting

Tx: varies...complicated/uncomplicated vs resistance vs age/risks
1700’s Dr. George Cleghorn (Scottish) realized quinine treats malaria

British solders drink ‘tonic’ of water and quinine

Hid the bitterness of quinine with gin then eventually added lemon/lime

“Gin and tonic”
Case 1: “Flu-like” Babesiosis

Parasite: Babesia microti

Tick vector:
(Ixodes scapularis
(Black legged deer tick)

Sx: “viral” + hemolytic anemia

Dx: suspicion + Blood smear (Giesma stain)

Tx:
\[
\frac{Azithro + Atovaquone}{Clinda + Quinidine} \times 10 \text{ days}
\]

Step 1: Treat the patient
Which one can we get?

Step 2: Keep the patient safe
“What’s the worst that can happen?”

- Anemia
- Thrombocytopenia
- Jaundice
- Renal failure
- Hepatic failure
- DIC
- ARDS / Resp failure
- Encephalopathy
Trend the labs...

<table>
<thead>
<tr>
<th>Lab</th>
<th>Day 4 sx</th>
<th>Day 5</th>
<th>Day 7</th>
<th>Day 10</th>
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<td>104</td>
<td>79</td>
<td>-</td>
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</table>
Case: Babesiosis

References

Case 2: “Headache”

22yo Female
CC: Headache

Chart check:

Previous ED visits:
29 April. ED. Headache
30 April. ED. Ovarian cyst
21 May. ED. N/V for months
24 May. ED. N/V + HA
07 June. ED. HA + pinpoint rash. —> admitted for r/o meningitis —> DC hosp day 3 (10 June)
11 June ED. HA
Case 2: “Headache”

22yo female from home
CC: headache

Onset: 2 weeks & gradually worsening
Location: between the temples
Duration: constant
Present upon awakening
Char: Throbbing. Similar to previous HA
Assoc: N/V, anorexia
Aggrav: sitting up, movement
Reliev: laying down, no mvmt.

ROS:
Pos:
Nausea
Vomiting
Anorexia
Dizziness
Recent spinal procedure (LP)

Neg:
Vision changes
Ataxia
Paresthesia
Weakness
Confusion
Neck pain
Back pain
Fever
Chills
Diarrhea
Caffeine
Case 2: “Headache”

PMH:
- Anxiety
- BiPolar
- Migraine

PSH:
- None
  (LP 2d prior)

Other:
- Discharged from hospital <24hrs ago for the same HA
  (Details to follow)
Case 2: “Headache”

Exam:

Positive:
- Neuro: HA when laid supine
- HA improved w/sitting upright

Negative:
- Gen: A&O x4, pleasant, comfortable (sitting)
- HEENT: No facial asymmetry. Head normocephalic, atraumatic. PERRLA, EOMI. Nasal turbinates moist, pink.
- Posterior pharynx symmetric, no exudates, no cobblestoning. Trachea midline.
- CV: No JVD. Heart tachycardic rate, regular rhythm. No clicks, rubs, gallops, murmurs.
- Resp: Symmetric chest rise, good effort. BL breath sounds clear.
- MSK: No midline spinal tenderness in C/T/L spines.
- Neuro: CN II-XII without deficit. Strength 5/5 in BL UE and LE. Sensation to light touch intact in BL UE and LE.
- DTR 2.4 in BL biceps, triceps, brachioradialis, patellar, achilles. No gate ataxia.
- HINTS exam: Appropriate corrective saccades with head impulse. Fatigable leftward nystagmus, negative test of skew.
- Skin: warm, dry. No rash. Site of prior LP nontender and without changes compared to surrounding skin.
- Psych: Affect is appropriate for situation
Case 2: “Headache”

Differential:

Primary Headache
  New daily persistent HA

Secondary headache
  • Subarachnoid Hemorrhage
  • Carotid artery dissection
  • Cerebral venous sinus thrombosis
  • Meningitis
  • Spontaneous intracranial hypotension
  • Post-traumatic HA
Case 2: “Headache”

Chart check:

Hosp admission from 07 June —> 10 June

<table>
<thead>
<tr>
<th>Imaging:</th>
<th>CT brain w/o contrast.</th>
<th>Negative</th>
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<tbody>
<tr>
<td>Echocardiogram.</td>
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<thead>
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<td>In-house infectious disease</td>
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<td>OSU infectious disease</td>
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<td>Rheumatology</td>
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</table>

Discharged on: Doxycycline, Cefdinir, Zofran, Ibuprofen
Case 2: “Headache”

- **History** describing the worst headache of life or a headache that is different than usual
- **Exertion** as a trigger for the headache
- **Age** greater than 50 years
- **Despite** treatment, headache persists
- **Acute** onset
- **Central nervous system findings**
- **HIV** or other immunocompromise
- **Fever** or other systemic symptoms
Case 2: “Headache”

Post-LP headache?

- Sagging of brain and meninges...stressing pain sensitive structures
- CSF loss activated adenosine receptors...compensatory venous dilation...stretch of pain sensitive fibers

Chasing a diagnosis:
1) month+ duration
2) unchanged: same character as on previous admit
3) day 5 post LP....if truly post LP should be resolved
Case 2: “Headache”

MRI C-spine:  Subdural collection within the posterior aspect of the cervical canal extending caudally, concerning for CSF leak.

MRI T-spine:  Fluid collection within the posterior aspect of the thoracic canal, likely subdural, concerning for CSF leak.

MRI L-spine:  Motion degraded exam. No obvious dural tear detected.
Case 2: “Headache”

MRI C-spine: Subdural collection within the posterior aspect of the cervical canal extending caudally, concerning for CSF leak.

MRI T-spine: Fluid collection on the posterior aspect of the thoracic canal, likely subdural, concerning for CSF leak.

MRI L-spine: Motion degraded exam. No obvious dural tear detected.
Case 2: “Headache”

Spontaneous dural tear → Spontaneous intracranial hypotension

| Sex         | ♂ > ♀  
|-------------|-------
|            | 2:1   |
| Age        | 30-40 |
| Incidence  | 5/100,000 |
| Associated with | Connective tissue disorders |
Case 2: “Headache”

Spontaneous dural tear → Spontaneous intracranial hypotension

Cause: Unknown
  1/3 have trivial trauma

Severity: variable.

Pattern: headache w/sitting upright...”Orthostatic headache”

Meningitis risk? None...no exposure to outside world

Treatment: Blood patch
Case 2: “Headache”

Spontaneous dural tear  →  Spontaneous intracranial hypotension

MRI = best option

CT?

Subtle subdural fluid collection
Collapse of ventricle
Subarachnoid cisterns collapsed (GRN)
Case 2: “Headache”

Spontaneous dural tear $\rightarrow$ Spontaneous intracranial hypotension

BLK $\triangle$: Sagging of brain
Causing flattening of pons

BLK $\rightarrow$: cerebellar tonsils
displaced down
(Mimics Chiari)

YEL $\triangle$: enlargement of
pituitary

...ventricle size
comparison...
Case 2: “Headache”

Before (showing leak)

After blood patch (Into Epidural space)
Case 2: “Headache”


