Cognitive Error and Visual Intelligence in Dermatologic Diagnoses

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Session Description
Becoming an expert dermatologist takes experience, and Malcolm Gladwell says in his book Outliers that it takes 10,000 hours (5 hours/day over 6 years) of deliberate practice for true expertise to develop. Deliberate practice in dermatology is augmented by knowledge of specific cognitive principles that affect visual perception. This session will open your eyes to the world of visual intelligence that underlies expert dermatologic diagnosis.

Learning Objectives
- Identify and understand concepts in visual perception
- Recognize how we come to an expert diagnosis in dermatology
- Methods to reduce diagnostic error and prevent perceptive errors

What is deliberate practice in dermatology/dermatopathology?

- On a practical level:
  - Seeing patients
  - Reading slides
- Going further:
  - Continuing education
    - Reading journals/journal clubs
    - Attending meetings
  - Honing visual skills
  - Deliberate review of what we don’t know – ideally with instant feedback
    - Grand rounds; other patient conferences
    - Dermatopathology consensus conferences

We find only the world we look for.

Henry David Thoreau
Pattern Recognition

- Key to dermatopathology (and dermatology)
- Keen observation is important
  - We can train the brain
    - With greater experience (through seeing slides/patients, atlases/books, lectures, etc...)
    - Using lists of clues and differentials
    - Through visual exercises (evaluating art, puzzles, comparing 2 or more entities, etc...)

Overview

- Quick mini test
- Principles of visual recognition
- Introduction to “visual intelligence”
  - Another mini test
  - “COBRA”
    - Who, what, when, where

Lung cancer nodule – bright white

Do you see any bright nodules of lung cancer?

Did you see anything else?

83% of radiologists didn’t notice the gorilla...
"[A] high level of expertise does not immunize individuals against inherent limitations of human attention and perception. Researchers should seek better understanding of these limits, so that medical and other man-made search tasks could be designed in ways that reduce the consequences of these limitations."

Inattentional blindness

- What we are focused on filters the world around us aggressively

Most children can recognize the cow.

Most adults lose the ability to see the bigger picture.

We don’t want to miss key details.

"BLINK" GUT

Think slow

We don’t want to miss the bigger picture

Thinking fast
Preventing cognitive error – “Diagnosis, fast and slow”

- In Daniel Kahneman’s book, *Thinking, fast and slow*, he addresses so-called System 1 (fast, "gut") and System 2 (slow, "logical, rational") thinking
  - Both systems can result in error
  - The 2 can complement each other

Diagnosis

- "Fast" – your instant, gestalt feeling
- "Slow" – going further to check for pertinent positive and negative evidence for your initial diagnosis, asking yourself why it couldn’t be something else (playing devil’s advocate)

Principles of visual recognition

Gestalt
- Definition: overall assessment – the whole that may be more than the individual parts
- Important elements of gestalt
  - Figure-ground separation
    - Part vs whole
    - Proximity and similarity
  - Color

Dog
Cat
Choosing the wrong “figure” may lead to cognitive error.
Choosing the wrong “figure” may lead to cognitive error

What would you call this?

Our own experience

What would you call this?

Orthopedist:
My kids (age 11)

*"allergic dermatitis"
*"shiny and bumpy"
*"neither look like a rash"
*"don’t know"

(age 7)

Babysitter:

*Dermatopathologist:

Mohs surgeon:

*"drug rash? I don’t know"
*"pink with white spots, elevated"

*"scab"

*"plaque psoriasis"

*"psoriasis"

Babysitter:

*"contact dermatitis"

Me: “You are right! How did you know that?”

Babysitter: “From seeing a coworker who has it and commercials”
What would you call this?

Our own experience

My kids/babysitter: No idea
Orthopedist: "Blister"
Mohs surgeon: "inflammatory cells – pustule"
Dermatopathologist: "spongotic dermatitis/eczema"

No idea
"I don't know"
"a little actinic keratosis?"
"psoriasiform dermatitis"

Gestalt: the same image can be interpreted in more than one way.

How do we decide?

Our own experience
Part vs. whole
Proximity/similarity
Color

perception – role of parts

Part vs. whole

perception – role of parts

Part vs. whole

perception – role of parts

Part vs. whole

perception – role of parts

Part vs. whole


Filling in the blanks incorrectly can lead to cognitive error.

How do we decide?
Our own experience
Part vs. whole
Proximity/similarity
Color

Proximity/similarity
Goltz syndrome
Blaschko distribution of
1. Yellowish papules/nodules (blue arrow)
2. Hyperpigmented macules (black arrow)
3. Telangiectasia (green arrow)
4. Dermal atrophy
5. "Splattered" hypopigmentation
Proximity/similarity

Pitfall: “melanoma in situ”
Grouping incorrectly can lead to cognitive error

Bilateral cheeks
Present x years, unchanging
Pseudomelanocytic nests
“Lichen planus pigmentosus”

Gestalt: the same image can be interpreted in more than one way.
How do we decide?
Our own experience
Part vs. whole
Proximity/similarity
Color
**Classic color (in lighter skin)**

<table>
<thead>
<tr>
<th>Light pink</th>
<th>Red pink</th>
<th>Salmon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morbilliform drug eruption</td>
<td>Psoriasis</td>
<td>Pityriasis rubra pilaris</td>
</tr>
</tbody>
</table>

Contact: the same image can be interpreted in more than one way.

- How do we decide?
- Our own experience
- Part vs. whole
- Perceiving/standard
- Color

Our brain fills in data for us.

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That we can still read words with jumbled letters and when vowels are missing.

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Perception – context

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The CAT

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“Visual intelligence”

- Being aware of perceptual filters helps us know what we might miss
- Own/close experience
- Geographic history, affinity, location
- Education
- Likes/dislikes
- Mood
- Information from others

The Stroop effect

- Name the color

GREEN

BLUE

GREEN

RED

More color theory

• Remember as many as you can
Recognition

- The Stroop effect
  - reading interferes with recognition
- Color theory (Brown and Lenneberg, 1954)
  - “names aid recognition and memory”

What do you see?

- Describe this next picture in one sentence

What did you see?

- In her Art of Perception class, Amy Herman relates that 50% of people do not see the big “C”
- Large “C” painted on a one-hundred-foot-high rock wall near Columbia University

Finding a name for something is a way of conjuring its existence, of making it possible for people to see a pattern where they didn’t see anything before.

-Howard Rheingold

Photo credit: Large letter C in wood, Redux Pictures, The New York Times, Suzanne DeChillo
Preventing cognitive error: “COBRA”

- Concentrate on the camouflaged
- Look again
- Look all the way and back
- Reposition patient or slide
- Reposition yourself
- One thing at a time
- Who, what, where, when?
- Take a Break
- Realign your expectations
- Ask someone else to look with you

Who, what, when, where of dermatology and dermatopathology

- Who?
  - patient

- What?
  - configuration, architecture
  - morphology
  - color (cell type)
  - secondary changes
  - benign vs malignant


Preventing cognitive error: Visual training

A few definitions...

- Cognition = ability of the brain to attend, identify, and to act
  OR
  = thoughts, mood, inclinations, decisions, actions
  encompasses alertness, concentration, perceptual speed, learning, memory, problem solving, creativity, mental endurance
- Metacognition = thinking about cognition

From Ch 1 of Mozart’s Brain and the Fighter Pilot: Unleashing Your Brain’s Potential by Richard Restak, MD