LESSONS IN CPC

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DISCLOSURE OF RELATIONSHIPS WITH INDUSTRY

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U001: Lessons in CPC

DISCLOSURES

Proscia, Inc. – Grants/research support

Castle Biosciences - Consultant
OBJECTIVES

- Describe heuristic and analytic diagnostic approaches
- Recognize interpretative errors in inflammatory dermatopathology
- Diagnose challenging cases, using errors as clues
- Tips for CPC: clinical history, images, and differentials
WHY SHOULD WE STUDY THIS?
Diagnostic errors are the 2nd most common cause of nonoperative adverse medical events.

Diagnostic errors in dermatology

- Dermatology: based on malpractice claims review
  1) Nonsurgical therapy: 55 percent
  2) Diagnostic errors: 32 percent
    - Not taking a biopsy and lack of CPC
  3) Surgical therapy: 13 percent

Errors and discordance in dermatopathology

- Difficult to estimate: often based on concordance

- Concordance: 66-77 percent

- Major discordance: 7 percent
  - Melanocytic, lymphoid, adnexal tumors

- ‘Errors’ in 7 percent of cases:
  - Failure to correlate pathology and clinical context
  - Lack of dermatologic knowledge

Errors and discordance in dermatopathology

- Studies of second opinion

- Major discordance rate up to 22 percent overall

- Inflammatory disorders: 33 percent
  - Wrong tissue reaction pattern: 50 percent
  - Right pattern, wrong differential: 20 percent

WHY IS IT SO DIFFICULT TO RECOGNIZE OUR OWN ERRORS?
Recognizing our own errors requires:

1) Cognition
2) Metacognition
3) Understanding of both
4) Memory for both
Cognition

- **System 1: Heuristic** → “gestalt”
- **System 2: Analytic** → “conscious checklist”

## Cognition: heuristic versus analytic approach

<table>
<thead>
<tr>
<th><strong>Heuristic</strong></th>
<th><strong>Analytic</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast: 2x</td>
<td>Slow: 40x</td>
</tr>
<tr>
<td>Thin slicing</td>
<td>Systematic</td>
</tr>
<tr>
<td>Filter signal from noise</td>
<td>Cannot filter signal from noise</td>
</tr>
<tr>
<td>Based on individual experience</td>
<td>Algorithms and checklists</td>
</tr>
<tr>
<td>Low scientific rigor</td>
<td>Evidenced-based</td>
</tr>
<tr>
<td>Higher error rates</td>
<td>Can still produce error</td>
</tr>
<tr>
<td>Greater risk for bias</td>
<td>Increased utilization and cost</td>
</tr>
<tr>
<td><strong>Requires experience</strong></td>
<td><strong>Does not require experience</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Dermatology</strong></th>
<th><strong>Dermatopathology</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary lesion heuristic</td>
<td>Location:</td>
</tr>
<tr>
<td>• Most reliable</td>
<td>• Epidermal, dermal, subcutaneous</td>
</tr>
<tr>
<td>Distribution</td>
<td>Neoplastic versus nonneoplastic</td>
</tr>
<tr>
<td>Pattern</td>
<td>Inflammatory reaction pattern</td>
</tr>
<tr>
<td>Color</td>
<td>Benign versus malignant</td>
</tr>
<tr>
<td>Morphology</td>
<td>Cytology</td>
</tr>
<tr>
<td>Texture</td>
<td>Mitoses</td>
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<td></td>
<td>Inclusion bodies</td>
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Cognitive bias and heuristics

• Heuristic $\rightarrow$ efficient and accurate diagnosis when used correctly

• Bias $\rightarrow$ diagnostic errors when used incorrectly

• Diagnostic errors: 50 percent associated with $\geq 1$ bias
  • Most common biases: premature closure and availability

Metacognition

• Thinking about how we think \(\rightarrow\) avoid ‘uncritical’ thought

• **Diagnostic expertise requires metacognition**

• Most misdiagnoses have multiple (4+) errors
  • Predictable and patterned co-occurrence

Cognitive bias in dermatopathology

• Premature closure
• Availability bias
• Anchoring bias
• Confirmation bias
• Representativeness bias
Cognitive bias in dermatopathology

- *Premature closure #1*
- Availability bias
- Anchoring bias
- Confirmation bias
- Representativeness bias
Premature closure

• Tendency to stop looking after encountering a diagnostic finding
  • Bias → make diagnosis then stop searching → wrong

Psoriasiform graft-versus-host-disease

• Case analysis
  • Premature closure
  • Widespread papulosquamous eruption in a transplant recipient
  • Multiple reaction patterns: psoriasiform + interface
  • May be acute or chronic
Psoriasiform + Interface dermatitis
CLUE: multiple patterns

- Psoriasiform + lichenoid interface
  - Pityriasis lichenoides
  - Syphilis
  - Lichenoid drug eruption
- Psoriasiform + vacuolar (cell-poor) interface
  - Psoriasiform drug eruption
  - Psoriasiform graft-versus-host disease
Asteatotic-like nutritional deficiency dermatosis

• Case analysis
  • Premature closure
  • Xerotic, eczema craquelé-like appearance
  • Multiple nutrient deficiencies

• CLUES
  • Subtle evidence of dysmaturity
  • Dermal edema
Cognitive bias in dermatopathology

• Premature closure
• Availability bias
• Anchoring bias
• Confirmation bias
• Representativeness bias
Availability bias

- Judging something to be **MORE** likely because it comes to mind readily
  - Bias → next case in sequence must be **SAME** as prior → **wrong**

Nutritional deficiency dermatosis

• Case analysis
  • Availability bias
  • Erosive intertrigo in patient with IBD
  • Low zinc and alkaline phosphatase levels

• CLUES:
  • Psoriasiform hyperplasia
  • Confluent parakeratosis
  • Epidermal pallor
Cognitive bias in dermatopathology

• Premature closure
• Availability bias
• Anchoring bias
• Confirmation bias
• Representativeness bias
Anchoring bias

- Locking on to features or prior diagnosis
  - Bias → doesn’t acknowledge additional findings → wrong

Darier disease

• Case analysis
• Anchoring bias
  • Requistion overwhelmed histopathology
  • Did not account for acantholytic dyskeratosis
• CLUE
  • Prominent granular cells with large nuclei
  • “Koilocyte-like change”
  • Helpful when obvious acantholysis is lacking
Cognitive bias in dermatopathology

• Premature closure
• Availability bias
• Anchoring bias
• Confirmation bias
• Representativeness bias
Confirmation bias

• Looking for evidence to support rather than refute
  - Bias → finding features to support erroneous impression → wrong

Factitious dermatitis

- Case analysis
- Confirmation bias
- Looking for necrosis as evidence of interface

**CLUES**

- Distorted keratinocytes
- Confluent epidermal necrosis with sharp demarcation
- Clue to exogenous insult
Epidermal necrosis

- *Interface dermatitis reaction pattern*
  - Lichen planus and variants
  - Erythema multiforme
  - Cutaneous lupus erythematosus
  - Pityriasis lichenoides
  - Graft-versus-host disease
  - Syphilis
Epidermal necrosis

- *Dysmaturation and exogenous insults*
  - Irritant dermatitis
  - Phototoxicity → ‘sunburn’ cells
  - Nutritional deficiency
  - Chemotherapy reactions
  - Bowen disease
  - Acantholytic dermatoses
Ochronotic keratoderma

• Case analysis
  • Confirmation bias
  • Keratoderma with *bluish* hue
  • **CLUE:** degenerative changes of the connective tissue are nonspecific → keratoderma with elastin alteration
Keratoderma with elastic fiber alterations

• **Thickened and fragmented elastic fibers: DDx**
  • Collagenous and elastotic marginal plaques
    • Trauma and photodamage
    • Degenerating, hyaline collagen and mucin or calcium deposits
  • Acrokeratoelastoidosis
    • Autosomal dominant
  • Alkaptonuria
    • Hyaline, degenerating collagen with or without ochre fibers
    • Autosomal recessive deficiency of homogentisic acid dioxygenase
Cognitive bias in dermatopathology

- Premature closure
- Availability bias
- Anchoring bias
- Confirmation bias
- Representativeness bias
Representativeness

• Judging something based on a mental prototype: “this feature = that disease”
  • Heuristic $\rightarrow$ finding $=$ diagnosis $\rightarrow$ correct
  • Bias $\rightarrow$ finding $\neq$ diagnosis $\rightarrow$ wrong

Actinic granuloma with reactive epithelial changes

- Case analysis
  - Representativeness bias
  - Annular plaques with elevated borders and atrophic centers on sun-damaged skin
  - Palisaded granulomas with elastophagocytosis
- **CLUE**
  - Reactive epidermal and follicular changes
  - Attempt at transepidermal elimination of altered elastin
Fontana-Masson

SOX-10
An Unusual Variant of Confluent and Reticulated Papillomatosis Masquerading as Tinea Versicolor

Kristin D. Hudacek, MD; Maryam S. Hague, MD; Abby L. Hochberg, MD; Carrie Ann Cusack, MD; Christina Lee Chung, MD
Skip Areas of Retained Melanin: A Clue to the Histopathological Diagnosis of Idiopathic Guttate Hypomelanosis

Rajiv Joshi
Guttate leukoderma of Darier disease

• Case analysis
  • Representativeness bias
  • Guttate leukoderma and family history
• CLUES
  • Skip melanization
    • Impaired melanocyte-keratinocyte adhesion
  • Epidermal changes of CRP
Guttate leukoderma

• Postinflammatory hypopigmentation
  • Decreased but retained melanocytes
  • Pigment incontinence

• Idiopathic guttate hypomelanosis
  • Skip melanization

• Guttate leukoderma of Darier disease
  • Skip melanization
  • Epidermal changes of CRP
Wong-type dermatomyositis

• Case analysis
• Representativeness bias
• Hyperkeratotic papules on extensors and interface

• **CLUES**
  • Columnar dyskeratosis
  • Follicular hyperkeratosis and plugging
  • Alternating orthokeratosis and parakeratosis
Columnar dyskeratosis versus cornoid lamellae

• **True cornoid lamella of porokeratosis**
  - Diagonal, *continuous* tier of parakeratotic cells
  - Porokeratosis

• **Columnar dyskeratosis: pseudocornoid lamella**
  - Epidermal dells or invaginations
  - Vertical, *discontinuous* tier of dyskeratotic cells
  • *Wong-type dermatomyositis* and EDV
Clinical information: bias or CPC?

- Does it confound interpretation?
  - Potential for anchoring and confirmation bias

- But clinical information is often necessary and helpful

- Can clinical information *bias or override* histopathology?

Impact of clinical images

• Study: recorded diagnosis before and after reviewing images

• Changes in diagnoses after reviewing images
  • 90 percent of changes: Wrong → Right

• Images decreased differentials in reports and improved confidence

Impact of clinical history

- Pre-history “blind” dermatopathology: 53 percent accurate
- Post-history CPC: additional 25 percent accurate
- 78 percent of inflammatory cases are accurate after CPC
- 22 percent still require clinical follow-up for accuracy

Less clinical information = more descriptive report

• With clinical information:
  • ZERO cases are inconsistent or descriptive

• Without clinical information:
  • Up to 17 percent are inconsistent AND descriptive!
    • Most common: “superficial perivascular dermatitis”

Longer ddx does NOT improve accuracy

• Initial clinical instinct is a powerful tool!

• First position: Correct in 55 percent

• Third-fourth positions: correct in 2-12 percent!
  • Fifth-sixth: ZERO

THANK YOU!

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