Barriers to arriving at a diagnosis in melanonychia

- The nail plate covers the source of the pigmentation
- Clinical and dermatoscopic cues can be misleading
  - Overlap of findings in benign and malignant lesions
- Surgical: lack of familiarity with nail anatomy, biopsy techniques, may lead to suboptimal specimens
- Histologic: many pathologists lack familiarity with nail unit pathology, diagnostic criteria
- Low cellularity, early melanoma can be missed

The goals of more accurate clinical and intraoperative diagnosis

- Eliminate the need for biopsy
- Develop criteria that can guide choice of biopsy technique
  - Eliminate the need for a biopsy and then excision
- Determine surgical margins more accurately
- Obtain information that might help in treatment decisions in histologically equivocal cases

Objectives

- Briefly provide context re: clinical evaluation of pigmented nail bands to date
  - Clinical signs (ABCDEF rule)
  - Dermatoscopy ("Onychoscopy")
  - Intraoperative dermatoscopy
- Explore the emerging prospects for clinical assessment
  - Reflectance confocal microscopy
  - Optical coherence tomography
Established and validated patterns for intraoperative dermatoscopy of the nail matrix and bed, in 100 consecutive cases

- Expose matrical area containing the lesion
- Use Dermlite polarized light dermatoscope, no contact needed
- Biopsy and perform routine microscopy on all cases

4 dermatoscopic patterns were identified:
  - Regular gray pattern (hypermelanosis)
  - Regular brown pattern (benign melanocytic hyperplasia/lentigo)
  - Regular brown pattern with globules or blebs (melanocytic nevi)
  - Irregular pattern (melanoma)

Regular gray pattern: presence of fine, regular grayish lines. (HYPERMELANOSIS)

Regular brown pattern: regular brown lines. (BENIGN MELANOCYTIC HYPERPLASIA)

Regular brown pattern with globules: regular longitudinal brown lines and presence of globules with regular size and distribution. (MELANOCYTIC NEVI)

Regular pattern: absence of any dermatoscopic pattern. (NORMAL NAIL)
Patterns of nail matrix and bed of longitudinal melanonychia by intraoperative dermatoscopy

Hirata SH, Yamada S, Enokihara MI, Di Chiacchio N, de Almeida FA, Enokihara MMSS, Michalany NS, Zaiac M, and Tosti A.

Irregular pattern: longitudinal lines of irregular color and thickness, presenting irregular globules and blotches. (MELANOMA)

Can newer imaging techniques be useful in nails?

- **Reflectance confocal microscopy (RCM)**
  - A laser-based high resolution imaging technique now faster with handheld device (in vivo and ex vivo)
  - Helpful in dx of tumors, assessment of margins, ETC!
  - For nail unit, can get images through the transparent plate to the nail epithelium (400-500 µm)
  - Uses in nail: ultrastructure, drug delivery, onychomycosis, inflammatory disease, some tumors, intraoperative assessment of tumor extent

Confocal microscopy for melanonychia

- Need to expose matrix (invasive)
- Dynamic exam at many levels
- Some ability to differentiate benign lesions from melanoma
  - 9 cases: 7 MIS and thin MM, 1 lentigo, one equivocal
  - Ex vivo exam was better; 7 Histologic dx of MIS in some cases
- Intraoperative diagnosis to allow for one definitive procedure
- Helpful to dx other causes of melanonychia (fungal, SCCIS)
- If helpful in low cellularity early or hyperpigmented lesions

Lentigo (ex vivo)

Bright cobblestone pattern

Melanoma in situ (in vivo)

- Disorganized cobblestone pattern
- Atypical large bright roundish melanocytes


- In vivo RCM of 30 consecutive cases of suspicious melanonychia
- Directly performed on nail matrix after exposure
- If unequivocal melanoma based on their prior observations (roundish or atypical pleomorphic bright cells), then complete nail unit excision performed
- If negative findings or equivocal, shave biopsy was performed
- Histopathologic examination then completed (routine H&E and Melan-A)

- All 16 out of 30 cases that appeared to be melanoma at time of RCM and excision were confirmed histologically
- 2 patients had SCC
- 12 patients did not have features of melanoma on RCM
  - 10 were confirmed as MMIS
  - 2 were confirmed as lentigo
- Sensitivity: 59%
- Specificity: 100%


- Four RCM patterns were described
  I: numerous atypical bright roundish cells at the DE junction, some dendritic, occasional pagetoid cells (correlates best with MM)
  II: Mainly nested pattern (cannot exclude nevus)
  III: Very bright cobblestone pattern, due to hyperpigmentation of keratinocytes (may miss subtle melanocytic hyperplasia)
  IV: variably densely distributed dendritic basal cells (no nests or roundish cells or cells in the dermis)
  - Can see in early MIS or a lentigo
  - Interpret with caution (clinicopathologic correlation)
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Optical coherence tomography

- A laser-based technology, first used in skin in 1997
- Resolution greater than 1 mm depth
- Dynamic or speckle variance OCT has better resolution; microvasculature patterns used for diagnosis
- Captures multiple images, stacks them, 10-20 sec to scan, processing software creates a coherent image in different planes

Optical coherence tomography in skin

- Main use is for non-MM skin CA
- Some inflammatory disease: psoriasis (inc. nail), scleroderma
- Onychomycosis, dermatophytoma
- Possible use for melanocytic lesions, perhaps studying microvasculature (not ready for prime time)

Optical coherence tomography-en face view


Optimal coherence tomography: melanocytic


Figure 4 Comparison of histology and OCT measurement of a lesion with a thickness of approximately 1 mm. The corresponding region is marked by the red dashed lines.

**Summary**

- Clinical evaluation methods of melanonychia
  - ABCDEF rule
  - Dermatoscopy (onychoscopy)
  - Intraoperative dermatoscopy
  - Confocal microscopy
  - Optical coherence tomography

- Limitations
  - Direct methods still invasive as nail matrix is relatively hidden
  - Overlapping features of benign and malignant, especially in early lesions, limit all methodologies
  - High tech modalities need more validation, are costly

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**Microscopic and molecular diagnosis**
Thank you!