Onychomycosis: Basic and Advanced Diagnosis and Therapy

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F013 Nails: Basic and Advanced Diagnosis and Therapy

DISCLOSURES
I do not have any relevant relationships with industry.
Confirm dx before initiating treatment

• Why?
• Simulators of onychomycosis are numerous
• Traumatic onychodystrophy, tumors, etc. can all look like onychomycosis
• If test(s) are negative, then no need Rx & we save patients unnecessary $, inconvenience, drug interactions, potential drug s.e.
• Without confirmation of dx then we do not know when to stop Rx
• Recent paper disputes need for dx before treatment based on view that it is more cost effective to make clinical diagnosis, then treat
Based on data from previous literature

- **Primary Outcomes: Direct Costs Dx & Rx; Cost to Avoid Harm for po Terbinafines**
- Cost of 12 wks po terbinafine=$10; Rx & Labs (1 lab draw AST&ALT)= $53; 1 drop efinaconazole x 48wks for 1 toe= $2307
- Assuming prevalence of 75%, per pt savings of empiric po terbinafine without KOH was $47 and without PAS was $135
- KOH and PAS screening before Rx with efinaconazole saved $272 and $406, per pt per nail respectively

Might Miss a Non-Dermatophyte Mold, Yeast

- In N. America, population based prevalence of onycho=7-14%
- In children <16 population based prevalence=0.2-2.6%
- There is a genetic predisposition to infection with dermatophyte
- 70-90% of onychomycosis due to dermatophyte (90% of that=T. rubrum)
- Yeasts e.g. C. parapsilosis (usually w/paronychia) & molds e.g. Scopulariopsis or Fusarium up to 30%, mixed infection in 5-15%
- Mold onychomycosis much more difficult to treat, may not respond
Onychomycosis Pathogenesis

• Pathogenesis of onychomycosis: dermatophytes in skin use keratinases to invade a dystrophic nail plate
• Inflammatory, traumatic, and neoplastic disorders all may cause nail dystrophy
• Therefore nail fragments with onychomycosis may be representative of one disorder (onychomycosis) or more than one disorder (onychomycosis in a nail plate from pt w/psoriasis)
• Therefore, use “Onychomycosis” when fungus invades plate
• If fungus does not invade plate, then be descriptive, CPC

Practice Gap
Dermatologists prescribe oral antifungals for assumed onychomycosis before confirmation of the diagnosis (medical knowledge, system-based practice).

Educational Gap
The educational gap includes the treatment of onychomycosis in dermatology residency training without confirmation of fungal infection (medical knowledge, system-based practice).

Best Practice
Confirmation of onychomycosis is recommended before systemic medications are prescribed because prolonged courses are necessary to treat nail disease. Although more research is needed to reach a consensus of the best and most cost-effective test for onychomycosis diagnosis, confirmation with one of the currently available methods should occur before treatment with an antifungal is initiated. Existing methods for appropriate dx include KOH, culture of specimens, and histologic sections stained with PAS, GMS. Each test has its own advantages and disadvantages, and there is no current conclusive evidence for one optimal test.

AAD Position Statement

AAD. Choosing Wisely. Available at: https://www.aad.org/education/choosing-wisely

“Don’t prescribe oral antifungal therapy for suspected nail fungus without confirmation of a fungal infection. Approximately half of all patients with suspected nail fungus do not have a fungal infection.”
## Diagnostic Tests

<table>
<thead>
<tr>
<th>Diagnostic Test for Onychomycosis</th>
<th>Advantages</th>
<th>Disadvantages</th>
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<tbody>
<tr>
<td>• KOH</td>
<td>Quick, simple, inexpensive</td>
<td>No ability to preserve specimen, No genus/species</td>
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<tr>
<td>• PAS on nail clipping sent to dermpath in formalin</td>
<td>Quick, simple, able to preserve specimen</td>
<td>More expensive than KOH for direct ID of fungus, no genus/species</td>
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<tr>
<td>• Dermatophyte Test Medium (DTM)</td>
<td>Quick, simple, relatively specific to dermatophytes</td>
<td>False positives and false negatives, no ability to preserve specimen</td>
</tr>
<tr>
<td>• Culture</td>
<td>Simple, identification of dermatophyte vs non-dermatophyte mold or yeast</td>
<td>Low sensitivity (50%), no genus/species</td>
</tr>
<tr>
<td>• Molecular (PCR)</td>
<td>Quick, provides genus/species</td>
<td>Expensive, requires skilled personnel, minimal current availability</td>
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Dermoscopy Assisted Dx Onychomycosis

- Spikes
- Longitudinal striations

Nail plate dermoscopy showing the vertical pierce after abrasion. Mycological samples from this area were positive.

Cultures Routinely Slow, Insensitive

- Recommended to attempt growth x 4 weeks before calling negative
- Recommended pts are off all antifungals x at least 2 weeks before cx
- Molds, yeast, bacteria may overgrow dermatophyte (false negative)
- Sensitivity at best < 50% (literature, UWHealth)
- In this manuscript, of 5459 submitted nail or skin cx, 20.66% were +
  - Of those 20.66%, 72.69% were + in first 7d, 24% turned + d7-14
  - Only 1.42% (n=16) were positive after 17d incubation period
  - Of those 16, 14 were nails, 4 had been on antifungals, 7 were KOH+ (no change in Rx)

Confirmation of dx is one piece of data. CPC is necessary

- Patients with underlying nail disease are at increased risk of onychomycosis
- Anything that causes nail dystrophy predisposes to onychomycosis
- Confirm using clinical exam that onychomycosis is pts only dx of concern before treating
- Dx of non-dermatophyte onychomycosis requires 1. Clinical presentation c/w onychomycosis; 2. the same non-dermatophyte cultured x 2 out of nail clippings; 3. absence of dermatophyte
- If CPC is poor then must pursue additional evaluation
Molecular Diagnostics: PCR

- Direct ID of dermatophyte or non-dermatophyte DNA in nail as opposed to use of morphology as used in other methods
- PCR uses primers targeted against topoisomerase II of T. rubrum, T. interdigitale, E. flocc
- Also used for dermatophyte ID are: internal transcribed spacer regions of ribosomal DNA and chitin synthase I gene (CHSI)

Development and Evaluation of a Novel Real-Time PCR for Pan-Dermatophyte Detection in Nail Specimens

Treatment

• Currently, topical therapy has some utility for mild onychomycosis
• Systemic therapy with po terbinafine is still the Rx gold standard
• Useful to educate pt regarding expectations of treatment i.e. will they have permanent onycholysis even if onychomycosis is cured?
• Onychomycosis is a frequent diagnosis without a predictably safe and effective treatment. Therefore, the treatment of onychomycosis is very active area of research including in the areas of medications and devices
• Once cured, pts with onychomycosis benefit from utilizing strategies to attempt to limit re-infection
Thank You!

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