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Acrylate Allergy To Fake Nails: Unique Presentations of Onchodystrophy and Subungual Hyperkeratosis

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Community Need for Recognition - A Unique and Painful Reaction to Acrylic Nails

- Artificial nails are commonly used worldwide for cosmetic nail enhancement [1]. Chittenden County, Vermont has 20 operating salons that offer acrylic nail procedures. Common procedures for the administration of acrylic nails include self-curing sculptured nails and light-cured nail lacquer, also known as “gel” nails.

- Both methods employ binding agents that utilize acrylic monomers or polymers. These acrylates are a frequent cause of allergic contact dermatitis in both manicurists and clients.

- A distinct presentation of allergic contact dermatitis to nail lacquer has been recently recognized in the community. It involves the sudden onset of painful nails and lack of associated eczematous changes [2, table 1]. There are currently two reported cases in the literature which also describe onycholysis and subungual hyperkeratosis without surrounding dermatitis, and two reported cases recognized by dermatologists in Chittenden County.

- This presentation of subungual hyperkeratosis and onycholysis can easily be misdiagnosed and treated unsuccessfully as onychomycosis or nail psoriasis. This underscores the importance of considering acrylate allergy with the presentation of painful nail dystrophy without surrounding dermatitis. This unique presentation of acrylate allergy will likely increase in prevalence as the gel nail manicure procedure increases in availability and popularity [1].
### Cost Considerations for Affected Population in Chittenden County

- Note: Average cost estimations are based on information obtained from consulting with dermatology offices and pharmacies in the Chittenden County community for a hypothetical patient on Green Mountain Care Insurance.
- Important consideration for population covered by Green Mountain Care (Medicaid) Insurance: UVM is the only dermatology practice in Chittenden County that will accept Medicaid insurance. They have approximately a 6 month waiting period for new appointments.
- Below is the out of pocket cost estimation to address this painful presentation of allergic contact dermatitis as soon as possible at a dermatology clinic that is not accepting of Medicaid.

<table>
<thead>
<tr>
<th>Appointment</th>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appointment 1</td>
<td>Primary care evaluation. Out of pocket topical ketoconazole trial to address potential onychomycosis: $23 dollars.</td>
<td></td>
</tr>
<tr>
<td>Appointment 2</td>
<td>Dermatology referral due to inadequate benefit: Cost of appointment: $120 dollars. Out of pocket trial of tazarotene cream (anti-psoriasis medication): $281.</td>
<td></td>
</tr>
<tr>
<td>Appointment 4</td>
<td>Improvement recognized. Allergic contact dermatitis suspected. Optional Patch testing performed to confirm allergy: $300.</td>
<td></td>
</tr>
<tr>
<td>Total Out of Pocket</td>
<td>$564- $864</td>
<td></td>
</tr>
</tbody>
</table>
Dr. Melanie Bui, UVM dermatologist has seen a unique case of this distinctly painful subungual allergic contact dermatitis to acrylic nail lacquer. She mentions that “most artificial nail allergies cause pruritic, eczematous skin changes, but this patient had distinctly painful subungual hyperkeratosis and distal oncholysis without periungual involvement. The usual differential for these nail findings are onychomycosis, psoriasis, subungual verruca, nail candidiasis and panchionycia congenital. Her case is distinctive due to the sudden onset, markedly painful nature and lack of associated eczematous changes.” She notes that this presentation may be seen more often in primary care offices around Vermont due to the growing popularity of the gel nail manicure.

Dr. Hannah Rabin and Dr. Daniel Goodyear of Richmond Family Practice have yet to see this presentation, and mention that this is likely due to the fact that they practice in the rural area of Richmond, VT where acrylic nail procedures are less common. They have seen presentations of onychomycosis and nail psoriasis which they agree could be very similar in presentation to the oncholysis and nail dyschromia seen in this presentation of allergic contact dermatitis.
Intervention and Methodology

Intervention:
- Providers at Richmond Family Practice were notified verbally of this unique presentation of acrylate allergy, and how it can easily be mistaken for onychomycosis or psoriasis. Knowledge of this diagnosis will decrease the cost of multiple inadequate medication trials (slide 3). Awareness is important due to the increasing accessibility of new nail salons in the Chittenden county area, specifically Essex and Williston.
- Research Dissemination: A case report with literature review outlining two locally reported cases is in progress to be submitted to a research journal.

Methodology
1. A distinct case of acrylate induced allergic contact dermatitis was recognized by Dr. Melanie Bui in the dermatology department, leading to a literature review of common presentations of allergic contact dermatitis from acrylate allergy.
2. Two cases were found in the literature of similar presentation of onycholysis without surrounding dermatitis, which can masquerade as a false diagnosis of onychomycosis or psoriasis.
3. Acrylic chemicals in 3 Chittenden County nail salons were researched via in-person or phone consultation with local manicurists. Salon owners preferred to remain anonymous. Brands of acrylic lacquer and offending acrylate ingredients were noted in order to confirm potential patient exposure in the community. Results listed on slide 6.
4. Information was discussed with local primary care providers at Richmond Family Practice to educate about newfound presentation of allergic contact dermatitis, and its appropriate treatment with topical steroid cream.
## Results and Data

### Common Acrylic Chemicals in the Chittenden County Community:

Lacquers at 3 Salons Investigated: *(None of the salons had hypoallergenic products).*
- **Salon 1:** Methyl Methacrylate (MMA) and 2 Hydroxyethyl methacrylate (2-HEMA)
- **Salon 2:** 2 Hydroxethyl methacrylate (2-HEMA)
- **Salon 3:** 2 Hydroxyethyl methacrylate (2-HEMA) and 2-ethylhexyl acrylate (2-HEA)

### Table 1: Epidemiology, Clinical Presentations and Patch Test Results of Similar Cases in the Literature[5]

<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Manicurist or Client</th>
<th>Clinical Presentation</th>
<th>Positive Patch Test Results</th>
<th>Gel or Sculptured</th>
<th>Time to Sensitization</th>
</tr>
</thead>
</table>
| 51  | F   | Client               | • Subungual hyperkeratosis  
     |                      | • Onycholysis        
     |                      | • Brown pigmentation of proximal nail folds | Not reported | sculptured | 6 years |
| 59  | F   | Client               | • Subungual hyperkeratosis  
     |                      | • Onycholysis        | MMA 2% pet (++) | gel | Not reported |
| 2   |     | Client               | • Subungual hyperkeratosis  
     |                      | • Onycholysis        | Gel | 3-4 years |

Abbreviations: pet, petroleum, MMA, methyl methacrylate

1Duration of regular manicures without symptoms
2Reported case in Chittenden County
Effectiveness and Limitations

- **Effective Treatment Identified:** This presentation of subungual hyperkeratosis and oncholysis can easily be misdiagnosed and treated unsuccessfully as onychomycosis or nail psoriasis [2]. Thus, eliciting a history of acrylic manicure use is important for distinction. **Effective treatment of this presentation of allergic contact dermatitis includes topical steroid treatment and the avoidance of acrylates** [2]. The case report will underscore topical steroids as an effective treatment. The specific case in Chittenden County that will be outlined in the report was **effectively treated with topical bethamethasone dipropionate lotion**.

- **A major limitation includes that the fact that acrylate allergy cannot be proven unless the patient undergoes an allergic skin patch test.** A patch test is usually only performed in a dermatology or allergists office, and some insurance programs may not cover it. If acrylic allergy is suspected, a patient should be instructed avoid all acrylic nail products. If patch testing can be performed, specific products without the offending chemical can be selected for future use.
  - There are 10 acrylics commonly used in nail products that may produce positive test results in allergic patients. These include 2-Hydroxyethyl methacrylate (2-HEMA), 2-ethylhexyl acrylate (2-HEA), ethyleneglycol dimethacrylate, (EGDMA), methyl methacrylate (MMA), ethyl methacrylate (EMA), 2-hydroxypropyl acrylate (2-HPA), ethyl acrylate (EA), ethyl cyanoacrylate (ECA), triethyleneglycol diacrylate (TREGDA), and tetrahydrofurfuryl methacrylate (THFM [3]. 2-HEMA is an especially common ingredient in both sculptured and gel nails, therefore, patients who have a reaction to this compound should be advised not to continue either [1,3].
  - **The chemicals identified in 3 different Chittenden County Salons included 2-HEMA, 2-HEA and MMA (slide 6).** These chemicals should be included in a potential patch test for patients presenting with acrylic allergic contact dermatitis in the Chittenden County community.
Future Interventions/Projects

• Patch test results of patients affected by this specific presentation of allergic contact dermatitis are scarce in the literature, and have yet to be done on any of the patients identified in Chittenden County. The only reported patch test in the literature indicates a positive result for methyl methacrylate (MMA) [table1, slide 6]. Future patch testing on effected patients may reveal a pattern of specific acrylic chemicals that produce this unique nail presentation. This creates ground for future investigation.

• Future interventions that providers can take to benefit their patients include advising them that hypoallergenic products often include acrylate functional monomers despite manufacturer claims [4]. Allergic patients may also experience cross-reactions with dental bonding materials or orthopedic prostheses, which often contain acrylic ingredients [1,5]. A 2005 retrospective study reports two patients with acrylic nail allergy who developed allergic stomatitis following dental bonding procedures [5].
References


2. Mendoca M, LaSenna C, Tosti A. Severe onchodystrophy due to allergic contact dermatitis from acrylic nails. Skin Appendage Disorders. 2015; 1: 91-94.


5. Lazarov A. Sensitization to acrylates is a common adverse reaction to artifical fingernails. Journal of the European Academy of Dermatology and Venereology. 2007; 21, 169-174.