INFANT & PEDIATRIC TOENAIL CONDITIONS

Review of Common Toenail Conditions and Current Treatment Options

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Beau’s Lines (Ridges)
Beau’s Lines (Ridges)

- These appear as indentations or grooves that run across the nails transversely.
- In infants, these lines are commonly seen soon after birth.
- In older children, they can be seen after a high fever, HFM Disease, trauma, or uncommonly, can be a sign of zinc deficiency or hypocalcemia.

A Clinical Study of Nail Changes Occurring Secondary to Hand-Foot-Mouth Disease: Onychomadesis and Beau's Lines

Ji Yeon Shin, Baek Kee Cho, and Hyun Jeong Park

Dear Editor:

Hand-foot-mouth disease (HFMD) is a common viral infection that often occurs in small epidemics during the spring or autumn. Clinically, HFMD is characterized by vesicular, erosive stomatitis, and maculopapular, vesicular lesions on the hands, feet, buttocks and groin. Coxsackievirus A16 (CA16) is the most common cause. Nail matrix arrest can present in several ways: Beau's line, defined as the transverse ridging of the nail plate, and onychomadesis, the complete shedding of the nail from the proximal matrix. Since the first cases reported in 2000, several additional cases of HFMD-associated nail matrix arrest have been reported in the literature. To the best of our knowledge, there have been no clinical studies regarding the association between HFMD and nail matrix arrest in Korea. This study was performed by reviewing the retrospective medical records and clinical photographs of 13 patients, who were diagnosed with nail changes, following HFMD. Physical examination was performed, and documented. The extent of nail plate involvement was used to divide the nail change morphology into two subtypes: (i) Beau's lines (Fig. 1A), and (ii) onychomadesis (Fig. 1B). Serologic testing for specific immunoglobulin M antibodies (SRL Laboratories, Tokyo, Japan) to CA6, CA10, CA16, and enterovirus 71 was performed in 3 patients.

Fig. 1

(A) Onychomadesis following hand-foot-mouth disease (HFMD) (patient 8); (B) Beau's lines and onychomadesis on the right index-fingernail following HFMD (patient 3); (C) Beau's lines on the right great toenail following HFMD (patient 1).
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Fig. 1
(A) Onychomadesis following hand-foot-mouth disease (HFMD) (patient 8). (B) Beau’s lines and onychomadesis on the right index-fingernail following HFMD (patient 3). (C) Beau's lines on the right great toenail following HFMD (patient 1).
A. Damage occurs to the nail matrix: trauma, fever, illness, malnutrition, etc.
B. Arrest in nail growth follows and then normal growth resumes.
(B, D) Great toenail dystrophy of left great toenail presenting growth retardation compared to (A, C) normal right great toenail during 4 months. Arrow head is a CO2 laser marking.
Onychomadesis is a periodic idiopathic shedding of the nails beginning at the **proximal end**, caused by the temporary arrest of the function of the nail matrix.
**Causes of Onychomadesis**

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Possible Causes</th>
</tr>
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<tbody>
<tr>
<td>Infectious</td>
<td>Hand-foot-and-mouth disease, varicella infection, scarlet fever, fungal infections</td>
</tr>
<tr>
<td>Systemic/dermatologic</td>
<td>Periungual dermatitis, Stevens-Johnson syndrome, toxic epidermal necrolysis, lichen planus, Kawasaki disease</td>
</tr>
<tr>
<td>Drug related</td>
<td>Chemotherapeutic agents, valproic acid, carbamazepine, lithium, azithromycin</td>
</tr>
<tr>
<td>Other</td>
<td>Nail trauma, familial causes, idiopathic causes</td>
</tr>
</tbody>
</table>
Shedding Light on Onychomadesis


Author(s): Fernanda Salgado, BA, Marc Zachary Handler, MD, Robert A. Schwartz, MD, MPH
Onychomadesis with proximal nail fold paronychia
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RETRONYCHIA

Onychomadesis with proximal nail fold paronychia

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14-year-old male with right hallux nail involvement

Great toenail dystrophy presenting with shrimp nail or multiple onychomadesis events

16-year-old male with left partial hallux nail

18-year-old male with left Total hallux nail
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Congenital Malalignment of Great Toenail (CMGT)
Congenital malalignment of the great toenail (CMGT) is based on a lateral deviation of the nail plate. This longitudinal axis shift is due to a deviation of the nail matrix, possibly caused by increased traction of the hypertrophic extensor tendon of the hallux.

Congenital malalignment of the big toe nail is typically present at birth. Ingrown toenails, paronychia and onchogryphosis are among the most common complications.

Depending on the degree of deviation, conservative or surgical treatment may be recommended.

Conservative Care

His brother and sister had also experienced ingrown toenails since childhood. Conservative care: with daily foot bath of diluted povidone-iodine, gentle massage of nail folds and topical mupirocin.

Figure 24.20 Soft tissue correction of malaligned toenail. A crescentic wedge resection is carried proximal to and below the nail bed and matrix staying close to the bone. A small Burow's triangle is excised at the start of the incision line. The entire nail unit is then swung over the resection and realigned and sutured.

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KOILONYCHIA (Spoon Nails)
Koilonychia, a concave nail dystrophy, has multiple etiologies and may be hereditary, acquired or idiopathic. These nails have a soft texture and appear scooped out, due to the thin, soft nature of a young child’s nails. They often occur on thumbs and hallux. In infants, koilonychia of the toenails is commonly transient and idiopathic, although familial and syndromic cases are reported. Koilonychias has been linked to iron deficiency, but mostly in adults.

Childhood koilonychia is typical of the toenails, whereas iron deficiency koilonychia is seen in both fingernails and toenails. It is not necessary to assess iron in a child with koilonychias of the toenails. Tests for iron deficiency should be pursued only if koilonychias is widespread and when it is seen in both fingernails and toenails.
Leukonychia

Inherited leukonychia occurs at birth and leukonychia totalis occurs in early childhood days.
3. **Pseudo leukonychia**: comes from an outside origin for example fungal infection (SWO) and excessive nail dehydration from nail polish.

**CLASSIFICATION of LEUKONYCHIA:**

- **True Leukonychia**
- **Apparent Leukonychia**
- **Pseudo Leukonychia**

1. **True Leukonychia**: the white coloration is the result of pathology in the *nail matrix*.
   A. Hereditary: Autosomal dominant disorder with or without other medical conditions,
   B. Acquired: the result of nail matrix disturbances due to systemic disease, injury or poisoning.

2. **Apparent Leukonychia**: the pathology is within the *subungual soft tissue*.

3. **Pseudo leukonychia**: comes from an *outside origin* for example fungal infection (SWO) and excessive nail dehydration from nail polish.

Inherited leukonychia occurs at birth and Leukonychia totalis occurs in early childhood.
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LEUKONYCHIA:

MUST rule-out Superficial White Onychomycosis (SWO) when dealing with Leukonychia. SWO scraps off easily with a fine curette, whereas leukonychia does not scrap off.

Leukonychia (puncta)

Also known as "true" leukonychia, this is the most common form of leukonychia. Picking and biting of the nails and micro-trauma to the base (matrix) of the toenail are a prominent causes in young children and nail biters. Besides parakeratosis, air trapped between the cells cause this appearance. When trauma is the case the white spots disappear after around eight months.
Onycholysis is the separation of a toenail from its nail bed. The separation occurs gradually and is usually painless.

The most common cause of onycholysis in children is trauma. Even slight trauma can cause onycholysis when it happens repetitively — for example, daily wear of tight socks or shoes, toe walking and activities like kicking.

Onycholysis is also commonly seen in toenail infections, especially onychomycosis, drugs and skin conditions.
The ends of the nails become frayed and split. Commonly seen in the first few years of life, onychoschizia is usually present on the thumbs and big toes and thought to be due to repeated trauma. Must rule out anemia and malnutrition when many nails are involved. Koilonychia, onychoschizia of toenails or absence of lunula are physiological features of nails in newborns.

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ONYCHOSCHIZIA (Frayed Nails)

TREATMENT OPTIONS:
1. Avoid excessive bathing
2. Apply moisturizing lotion regularly to toenails after bathing
3. Take 2.5 mg Biotin (Vit B-7) Supplementation daily.

*Should not be taken during pregnancy.

The FDA is warning that high doses of Vit B7 (>5 mg/day) can interfere with many common laboratory tests.

Candidiasis Onychomycosis Difficult to Treat Unless Proper Diagnosis is Made.

8-year-old boy
ATOPIC DERMATOSIS
Chronic Atopy w/ Xerosis & Nail Dystrophy in 12-YO Boy
with Asthma and Upper Respiratory Bronchitis

Frequently misdiagnosed as tinea pedis and onychomycosis

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ATOPIC DERMATITIS

Generalized: Accentuated skin lines & creases – xerosis

Chronic Focal: Frequently misdiagnosed as tinea infection
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ATOPIC DERMATITIS

Hyperlinear palmar and finger creases

Lichenification, dystrophic nails, xerosis, accentuated lines
• The Diagnosis of Pediatric Eczema or Atopic Dermatitis is Made by Exclusion and When the Patient has Three or More of the Major Features and Three or More of the Minor Features of Atopic Dermatitis.
ATOPIC DERMATITIS

• MAJOR Features (Must Have 3 or More):

  • Pruritus
  • Typical Morphology and Distribution
  • Facial & Extensor Involvement in Infants or Children
  • Chronic or Relapsing Dermatitis
  • Personal or Family History of Asthma, Allergic Rhinitis, or Atopic Dermatitis
ATOPIC DERMATITIS

• MINOR Features (Must Have 3 or More):

  • Cheilitis (dry cracked corners of the mouth)
  • Conjunctivitis (recurrent)
  • Eczema
  • Facial Pallor/Facial Erythema
  • Food Allergies or Intolerances
  • Hand Dermatitis
  • Ichthyosis
  • Itching when Sweating
  • Keratosis Pilaris
  • Orbital Darkening
  • Palmar Hyperlinearity
  • Pityriasis Alba
  • Wool Intolerance
  • Xerosis
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Candida Paronychia

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En Bloc Resection of Proximal Nail Fold

Chronic Candida Paronychia

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SUBUNGUAL OSTEOCHONDROMA (or EXOSTOSIS)

Subungual exostoses and osteochondromas more common on hallux than other toes.

Clinically, osteochondroma and exostosis are difficult to distinguish.

Histologically, the cartilaginous cap of exostoses is made of fibrocartilage, whereas in osteochondromas, it is hyaline cartilage and is confluent with the underlying trabecular and cortical bone.

SUBUNGUAL OSTEOMA

Subungual osteochon-roma: Clinical and Radiologic Features and Treatment

HERIBERTO VÁZQUEZ-FLORES, MD,* JUDITH DOMINGUEZ-CHERIT, MD,† MARIA ELISA VEGA-MEMJIE, MD,* and MARIMAR SÁEZ-DE-OCARIZ, MD*†

*Dermatologists and Dermatologic Surgeon, †Chief of Dermatologic Surgery, ‡Chief of Dermatopathology, and ††Dermatologist, Dermatologic Department, Hospital General “Dr Manuel Gea González”, Mexico City, Mexico

Background. Subungual osteochondromas are relatively rare. Objective. The objective was to evaluate the clinical, histologic, radiologic, and therapeutic features of subungual osteochondroma.

Methods. We retrospectively analyzed 27 cases of subungual osteochondroma evaluating the clinical manifestations, the radiologic and histologic features, and the treatment.

Results. There were 20 females and 7 males. The first toe was the most commonly involved. Previous trauma was recalled in 40.7% of the cases. Subungual osteochondromas appeared as firm, exophytic tumors beneath the ungual plate. Twenty-five patients had pain. The radiologic films demonstrated the presence of a juxtaepiphysial radiolucent cap surrounded in some cases by cortical bone. A trephine-like excision was performed to expose the tumor and cut it through the base, followed by curettage of the bony bed. Radiologic controls were taken 30 and 60 days after surgery and in cases of symptomatology. There were three cases of recurrence and two cases of incomplete excision.

Conclusions. Subungual osteochondroma should be distinguished from other subungual masses. The diagnosis of subungual osteochondroma is clinicoradiologic.

HERIBERTO VÁZQUEZ-FLORES, MD, JUDITH DOMINGUEZ-CHERIT, MD, MARÍA ELISA VEGA-MEMJIE, MD, and MARIMAR SÁEZ-DE-OCARIZ, MD HAVE INDICATED NO SIGNIFICANT INTEREST WITH COMMERCIAL SUPPORTERS.

OSTEOCHONDROMA REPRESENTS the most common bone tumor and is considered a developmental lesion rather than a true neoplasm. It constitutes 20% to 50% of all benign bone tumors and 10% to 15% of all bone tumors.1 Its radiologic features are often pathognomonic, being composed of cortical and trabecular bone with an overlying hyaline cartilage cap that must demonstrate continuity with the underlying parent bone cortex and medullary canal.1,2,3

Osteochondroma is a benign osteocartilaginous outgrowth affecting bones with enchondral growth such as large bones, arising adjacent to the cortex and next to the metaphysis.4 In very few cases this tumor affects small bones, localizing to the distal phalanx and producing deformity of the overlying nail. These cases are termed subungual osteochondromas5 and are altogether with subungual exostosis the most common bony lesions affecting the nail unit.6

In recent years four benign subungual tumors have received considerable attention: exostosis, osteochon-
droma, enchondroma, and epidermoid cyst. Among these four, the difference between subungual osteochondromas and subungual exostosis is not very clear. For some authors subungual exostosis is a variant of osteochondroma,6,7,8 whereas some others have described differences among them.7,8,9 Norton8 in 1980 proposed a series of data to help distinguish among both entities. In summary, the bony exocurrence in subungual exostosis is distal related to the metaphyseal area, and in subungual osteochondroma it is in proximity with the metaphyseal area. Besides, the cap in exostosis is composed of fibrocartilage, whereas in osteochondromas it is composed of hyaline cartilage.5

Clinically, subungual osteochondromas present as firm nodules, with or without associated nail plate deformity, frequently tender on palpation.10-12 Surgery is the treatment of choice in symptomatic cases and in those tumors with vascular or nerve compression. In subungual osteochondromas the goals of treatment are to remove the tumor, to avoid recurrences, and to preserve the ungual apparatus.13,14

The aim of the present study is to evaluate the clinical, histologic, and radiologic features of subungual osteochondroma, as well as its surgical treatment.
Osteochondroma
Surgical Treatment
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Courtesy of Stephen Mariash, DPM
Ingrown toenails are one of the most common reasons for presentation due to nail problems in infants and early childhood.

ONYCHOCRYPTOSIS (Ingrown Nails)
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TREATMENT:

A. Birth to 2 years: Very conservative unless extremely infected/ingrown
B. 2 to 4 years: Conservative to Spiculectomy (removing ingrown border)
C. 4 to 12 years: Conservative to Partial Nail Surgery (wedge with phenol)
D. 12 to 18 years: Partial Nail Surgery to Partial Matrixectomy (Winograd-type)

   (Besides Streptococcus sp, researchers have found that breast milk sugars were also effective against two other pathogens including Staphylococcus aureus and Pseudomonas aeruginosa). If not breast feeding, then topical mupiricin.

B. Daily massage with antibiotic ointment (mupirocin) to Spiculectomy.

C. Partial nail wedge resection with phenol. Wedge resection plus phenol had a 4% recurrence rate, whereas the wedge resection only had a 2% recurrence.

D. Partial Matrixectomy (Winograd-type) Preferred.

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CONSERVATE TREATMENT OPTIONS:

Use soft pencil eraser to push ingrown tissue

Tape, Steri-strip or bandaid strapping

Cotton


A conservative treatment for ingrown toenails in children.

Lazar L, et al.

A conservative treatment for ingrown toenails in children.


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CONSERVATE TREATMENT OPTIONS: Gadgets
1. Apply cream or lotion to toenails daily after bathing.
2. Trim toenails half as often as fingernails.
3. Use special nail scissors to trim nails but don’t bite the baby’s toenails.
4. Massage the skin away from the toenails with each diaper change.
5. Make sure socks and booties are not too tight.
6. See your podiatrist if any concerns or conditions present themselves.
Things we didn’t talk about:

- Onychomycosis
- Lichen planus
- Toenail biting
- 20-nail Syndrome: trachon
- Pachyonychia
- Onychomatricoma
- Micronychia
- Anonychia
- Dozens of other conditions

### Nails disorders

<table>
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<tr>
<th>No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>Absent part: anonychia congenita</td>
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<tr>
<td>2</td>
<td>Pitting: Psoriasis</td>
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<tr>
<td>3</td>
<td>Cuticle invasion: lichen planus</td>
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<tr>
<td>4</td>
<td>Dark brown pigmentation, ridging: monilia</td>
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<tr>
<td>5</td>
<td>Distal onycholysis: Tinea</td>
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<tr>
<td>6</td>
<td>Spoon nails: Iron deficiency</td>
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<td>7</td>
<td>Discoloured nails with inverted edges:</td>
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<td></td>
<td>Ectodermal dysplasia</td>
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<tr>
<td>8</td>
<td>Clubbing: toxins-malignancy-hypoxia</td>
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<td>9</td>
<td>Short and overcut nails (biting): anxiety</td>
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<td>10</td>
<td>Splinter haemorrhage: Infective endocarditis</td>
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<td>Lymphoedema- bronchiectasis-lymphoma</td>
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<td>Half and half: hepatic cirrhosis</td>
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<td>Ridging: Rheumatoid arthritis</td>
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<td>Longitudinal Brown Lines:</td>
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<td>Addison’s disease- Breast cancer- Melanoma</td>
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<td>White nails: anemia</td>
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<td>Red nail: polycytemia- systemic lupus</td>
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<td>Horizontal white and pink bands:</td>
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<td>Nephrotic syndrome</td>
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<td>18</td>
<td>Brittle Nail: detergents and water- hypothyrodism</td>
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</tbody>
</table>

#### Notes:
- Nails disorders are caused by various conditions, ranging from infections to genetic disorders.
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CONCLUSION

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