DOMAŃSKI, Mikołaj, WIERZEJSKA, Natalia, KOPCZYŃSKA, Barbara, CZYŻNIEWSKA, Oliwia, CZUPRYŃSKA, Karolina, OTRĘBA, Karina, SZAŁAJSKA, Julia and WOJCIESZEK, Maria. Whitlow, felon and paronychia - a clinical review of superficial hand infections. Quality in Sport. 2024;24:55531. eISSN 2450-3118.
https://dx.doi.org/10.12775/QS.2024.24.55531
https://apcz.umk.pl/QS/article/view/55531

The journal has been 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.
Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 r. Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398.
Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 06.09.2024. Revised: 19.09.2024. Accepted: 09.10.2024. Published: 10.10.2024.

Whitlow, felon and paronychia - a clinical review of superficial hand infections

Authors:

Mikołaj Domański, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland

https://orcid.org/0009-0004-1581-6640

mikolajdomanski999@gmail.com

Natalia Wierzejska, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland

https://orcid.org/0009-0006-5373-400X

nwierzejska1@gmail.com

Barbara Kopczyńska, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland

https://orcid.org/0009-0007-5944-0165

kopczynskabasia@gmail.com

Oliwia Czyżniewska, School of Medicine, Collegium Medicum, University of Warmia and Mazury, Oczapowskiego 2, 10-719 Olsztyn, Warmińsko-Mazurskie, Poland

https://orcid.org/0009-0003-0388-0269

oliwia.czyzniewska@gmail.com

Karolina Czupryńska, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0007-8932-2688
czuprynska.karolina@gmail.com
Karina Otręba, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0009-9655-5353
karina.zofia.otreba@gmail.com
Julia Szałajska, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0007-8866-5419
juliaszalajska.mail@gmail.com
Maria Wojcieszek, Medical University of Warsaw, Żwirki i Wigury 61, 02-091 Warsaw, Poland
https://orcid.org/0009-0008-3807-7317
mariajuliawojcieszek@gmail.com

Abstract:
Paronychia, felon and herpetic whitlow are common superficial hand infections. Although having similarities there are many differences between clinical presentation and treatment. Paronychia can present as acute and chronic condition. Treatment options varies from medical to surgical therapy. Formed abscesses may require drainage and possible antibiotic course. Herpetic whitlow is rare manifestation of hand infection with unique treatment options. Chronic infections differs in etiology and clinical presentation and need specialized treatment. Role of noninfectious causes should always be considered, including malignancy if no adequate treatment response is gained. Making correct diagnosis, followed by adequate treatment will prevent huge range of complications. Article reviews common hand infections, presentation, diagnosis and treatment strategies.

Key words: paronychia, nail diseases, skin diseases, infections

Introduction:

Hand infections are common. They can be divided due to anatomy to: superficial infections – superficial to the hand tendons or deep infections - deep to the tendons.[1] Superficial are the more common and the most typical site is the fingertip.[2] Paronychia and felon are the most frequent presentations of finger infections [3] and knowledge of herpetic whitlow is beneficial for differential diagnosis. Although perceived as mild diseases their therapeutic management vary from non-invasive, through pharmacological to surgical treatment hence to avoid misdiagnosis. Inappropriate treatment or complications familiarity to these diseases and their differential diagnosis is needed. Aim of this paper is to by reviewing current literature on etiology, epidemiology, clinical presentation and therapeutic options and complications to bring reader update to most recent knowledge.

Material and methods

A systematic review of literature from PubMed and Google Scholar database.

ACUTE PARONYCHIA

Definition and epidemiology

Acute paronychia is lasting less than six weeks inflammation localized on dorsal hand side around nail base or lateral folds.[4]

It is caused by trauma of nail and surrounding tissues resulting in opening portal of entry for microorganisms.[5,6]

Most common pathogen is Staphylococus aureus [7] , followed by Staphylococus epidemidis and Streptococcus beta-haemolyticus. Rarer possible bacteria include: Pasteurella multocida, Corynebacterium, Escherichia coli, Pseudomonas spp, Veillonella, Proteus vulgaris, Clostridium and many more.[8–11] Infection caused by polymicrobial flora is estimated between 11,7%[10], 30%[12] ,73%[13] up to 84%[8]. Acute paronychia is commonly treated as bacterial infection, but can also be caused by viruses or fungi associated rather with chronic paronychia like Candida.[14] Pediatric population is more prone to paronychia, and is associated with higher rate of polymicrobial flora due to nail biting and finger sucking.[14] Acute paronychia risk factors include nail biting, manicure, hangnail, dishwashing, in growing nail (onychocryptosis), inappropriate nail or cuticle cutting and thumb sucking.[5,13,15–18]

Diagnosis and treatment

Acute paronychia is diagnosed by its clinical presentation. Patient often reports tenderness, pulsating finger pain, that increases after lowering limb. Skin around nail can be swollen, reddened and hot. Abscess may form and can spontaneously drain itself. If abscess passes under the nail plate, a yellowish discoloration can be seen and nail fluctuance may occur. Increasing amount of pus can elevate the nail plate. [3,4]

Acute paronychia can be treated with oral antibiotics, surgical incision and drainage. Soaking finger in warm water multiple times a day can be effective treatment in early infection with no abscess formed. [18] Warm soaks also promote spontaneous drainage. There is no randomized trial of treatment with warm soaks however are frequently recommended. [19]

Surgical treatment is required for abscess drainage. In case of ingrown nail or abscess localized under nail plate partial nail removal should be performed and in case of spread infection whole nail may be removed. These procedures and can be performed under local or Oberst block anesthesia. [20]

It is important to distinguish bacterial paronychia with viral infection, in with surgical interventions are contraindicated. [21]

There is no consensus regarding antibiotic therapy. Some studies suggest that routine antibiotics are not necessary if surgical excision is complete and patient wound care is appropriate. [17,22] Indications for treatment with oral antibiotics include patients with diabetes mellitus, immunocompromised with circulatory disorders, prosthetic heart valves and systemic symptoms. [23,24] Children at risk of oral bacteria paronychia should have accordingly modified therapy - penicillin, ampicillin, clindamycin and amoxicillin-clavulanate should be considered. [25]

If not treated acute paronychia can spread to other fingers due to common tendon sheaths and cellulitis can develop, and recurrent acute paronychia can lead to chronic paronychia. [25]

CHRONIC PARONYCHIA

Definition and epidemiology

Chronic paronychia is lasting equal or more than six weeks inflammation localized on dorsal hand side around nail base or lateral folds. Chronic inflammation impairs blood flow by eponychium fibrosing slowing spontaneous healing. [4] It is associated with repetitive mechanical injuries, skin irritants and allergens. Risk factors are jobs that require prolonged contact with water and wet hands as bartenders, swimmers, dishwashers, housekeepers, nurses

and chefs. [3,26,27] Most common factor is Candida albicans - up to 95%. [3,26] but it its suggested that it is opportunistic colonization rather than a cause. [28] Other possible causes include atypical mycobacteria [3], syphilis, viruses, and it is not uncommon to see multifactorial cause. [14] Various drugs need to be considered, such as EGFR inhibitors, mTOR inhibitors, BRAF inhibitors CD20 antagonists MEK/ERK inhibitors, retinoids, lamivudine. [29,30] In patients with HIV infection indinavir is most common cause of chronic paronychia. [31] Drug induced paronychia may involve more than one nail. [32] It is worth mentioning that drug induced paronychia can occur immediately to 12 months. Conditions prone to chronic paronychia include zinc deficiency [33], pemphigus vulgaris, psoriasis, diabetes, immunosuppression and Raynaud's disease. [3,34–36] Paraneoplastic Bazex Syndrome can present paronychia [37] and squamous cell carcinoma can mimic paronychia. [38] Nail fold metastases have been reported. [39]

Diagnosis and treatment

Chronic paronychia symptoms are less severe compared to acute paronychia. [3] They include recurring self-limiting episodes of pain, swelling and inflammation around nail bed, often recure after water exposure. [25] Nail due to recurring inflammation may be thickened, rounded, discolored, deep horizontal groves known as Beau's lines may develop. Abscesses are less common. [36] Green discoloration of nail is characteristic to Pseudomonas aeruginosa infection. In case of no response to standard treatment malignancy should be considered as a cause. [40]

Treatment differs into medical and surgical route. It is also very important to instruct patient in correct nail clipping technique, encourage frequent moisturizing, avoid irritating substances, and prolonged water exposure. These are key factors for chronic paronychia management. [4,41] Cotton gloves worn under vinyl gloves may be helpful in these situations. [25] Topical and systemic anti-fungal medications like ketoconazole or topical ciclopirox are effective forms of treatment. [36] Topical steroids show excellent treatment outcome. [28] Combined topical antifungal and steroid therapy has not been proofed as superior to only topical steroid therapy. [4] Topical tacrolimus therapy can be hugely beneficial. [27] Both of these drugs efficacy can be explained by no consensus regarding Candida albicans role in chronic paronychia. [27] In case of secondary infection oral antibiotics may be necessary. Zinc supplementation can improve nail resistance. [33] Contrary artificial nails do not strengthen, but cause fragile and brittle nails. [33]

Operative treatment is indicated only if chronic paronychia does not respond to medications. Marsupialization of eponychium combined with soaks and dressing changes showed 90% effectiveness. [4] In case of concurred nail irregularities and recurrence marsupialization combined with nail removal is an effective technique. [42] According to systemic analysis of

retronychia surgical nail avulsion had a highest cure rate of 78,2%, but was associated with 9,6% complication rate, mainly nail deformities. [43] In 2011 Swiss roll technique was described. By elevating nail fold and rolling dressing under it Pabari et. al. enabled irrigation and drainage for chronic paronychia up to 7 days, and by retaining nail plate it shows superior healing rate and avoids nail deforming. [44] All of surgical procedures can be performed under digital block anesthesia or infiltrative anesthesia. Common complication of chronic paronychia is mainly nail dystrophy. [45]

FELON

Definition and epidemiology

Felon is an infection of palmar side affecting pulp of fingertip. [46] It is caused by minor trauma like a wood splinter, glass shards, cuts, abrasions, majority of patients have history if penetrating trauma. [3,47] Digit closed compartments, inflammation leads to increased pressure that causes throbbing pain, that increases during the night. In extremally rare cases chronic felon infection can spread through fibrous compartments and cause skin slough, lymphangitis, tenosynovitis, arthritis, osteomyelitis or ischemic necrosis. [47,48] In case of no adequate treatment patient can event present systemic symptoms, even endocarditis and sepsis. [24,49] Most common etiology is Staphylococcus aureus followed by polymicrobial flora, Streptococcus pyogenes and anaerobes. [50,51]

Diagnosis and treatment

Clinical examination and characteristic symptoms are sufficient to make a diagnosis, point of care ultrasonography may be helpful to access for abscess formation or foreign body susception. [52,53] Treatment consists primarily of surgical drainage and in limited cases antibiotics. Oral antibiotics are controversial, even after surgical drainage. There is a lack of studies comparing this intervention. [54] Many physicians order these based on their habits, despite there is just one study reporting benefits of antibiotics. [24] Based on modern studies, antibiotics should be used in patients presenting complications, immunocompromised, diabetic or recipients of prosthetics. [24,49–51,54,55] Surgical approach in needed in case of formed abscess, spontaneous drainage may not be complete and lead to complications. [56] For superficial felons volar longitudinal incision is preferred due to lover complication rate. [49,57] For uncomplicated deep felons midline or mid-lateral incision parallel to nail should be performed. Lateral and transverse incision showed higher complication rate consisting of injuring neurovascular bundle, anesthesia or neuromas. [48,58] Blunt dissection may be needed, followed by up to 48 packing. Finger should be splinted and elevated. Preferred anesthesia is

digital block. [3] Warm soaks may be sufficient if no abscess is formed and can improve wound healing after drainage. [3,59]

HERPETIC WHITLOW

Definition and epidemiology

Herpetic whitlow is rare manifestation of human herpes simplex virus infection. It can be caused by oral HSV-1 or genital HSV-2 virus. It can be transmitted from herpes labialis patients. In children often cause is autoinoculation from labial, genital or oral herpes. [21] Infection develops mostly on hand digits, but toe infections are also possible. [60] Herpetic whitlow develops through direct contact with herpes lesions or from infected patient saliva. [61] Infection incubation from 2 to 14 days prior to exposure, and is contagious till end of viral shedding – after crust forms over vesicles. Usually infection is self-limiting and resolves itself in three weeks. Risk factors include medical professions, especially nurses, dentists and anesthesiology staff. [61–65] Usage of gloves reduced incidence of herpetic whitlow. [64] Primary lesion progresses from papule to vesicle. [62] Symptoms include pain, burning or tingling sensation, erythema, lymphangitis and groups of vesicles develop. Prodromal malaise and fever may occur. [64,66–68] Vesicles can rupture, revealing clear fluid and then ulcerate. These vesicles are prone to secondary bacterial, causing systemic symptoms. It is important to distinguish herpetic whitlow from bacterial infection to avoid unnecessary surgical treatment or antibiotic usage. [21,67] About 20% of patients may experience less severe recurrent infections. [60,69]

Diagnosis and treatment

The diagnosis is based on clinical presentation and history. [70] If the diagnosis is uncertain, Tzank testing and PCR are available. Treatment should be symptomatic. Systemic antivirals as acyclovir can reduce symptoms duration. [71] Alternative oral drugs include valaciclovir and famciclovir. [72] Topical acyclovir is not beneficial and should not be prescribed. [21] Routine deep surgical treatment is contraindicated due to increased risk of viremia and herpes encephalitis, however unroofing vesicles can reduce pain. Antibiotics role is limited to treat bacterial superinfections. [66,67]

CONCLUSION

Our study aimed to compare the clinical features, etiology, and prognosis of four similar diseases: acute and chronic paronychia, felon, and herpetic whitlow. Acute paronychia and felon share a common etiology and similar treatment, differing in the affected hand site.

Untreated felons can result in much more severe, deep infections. The key to chronic paronychia is to take a detailed medical history about the duration of symptoms, risk factors, and patient medications, and seek out nail deformities like Beau lines. Herpetic whitlow displays unique fluid-filled blisters that become pustules, and it is hugely important to make a correct diagnosis due to contraindicated surgical treatment. Herpetic whitlows can remarkably reoccur. Overall, knowledge about these hand infections in everyday clinical practice can not only improve patient outcomes, avoid wrong treatment, and decrease unnecessary antibiotic usage.

Disclosure

Author's contribution

Conceptualization: Mikołaj Domański and Natalia Wierzejska; Methodology: Barbara Kopczyńska and Maria Wojcieszek; Software: Oliwia Czyżniewska; Check: Karina Otręba; Formal analysis: Barbara Kopczyńska; Investigation: Natalia Wierzejska and Mikołaj Domański; Resources: Karolina Czupryńska and Julia Szałajska; Data curation: Barbara Kopczyńska and Maria Wojcieszek; Writing - rough preparation: Natalia Wierzejska and Mikołaj Domański; Writing - review and editing, Karolina Czupryńska; Visualization: Oliwia Czyżniewska and Julia Szałajska; Supervision: Natalia Wierzejska; Project administration: Karina Otręba; Receiving funding - no specific funding.

All authors have read and agreed with the published version of the manuscript.

Financing statement

This research received no external funding.

Institutional Review Board Statement

Not applicable.

Informed Consent Statement

Not applicable.

Data Availability Statement

Not applicable.

Conflict of interest

The authors deny any conflict of interest.

REFERENCES

1. Patel DB, Emmanuel NB, Stevanovic M V., et al. Hand Infections: Anatomy, Types and Spread of Infection, Imaging Findings, and Treatment Options. *https://doi.org/101148/rg347130101*. 2014;34(7):1968-1986. doi:10.1148/RG.347130101
2. Barger J, Garg R, Wang F, Chen N. Fingertip Infections. *Hand Clin*. 2020;36(3):313-321. doi:10.1016/J.HCL.2020.03.004
3. Jebson PJL. INFECTIONS OF THE FINGERTIP: Paronychias and Felons. *Hand Clin*. 1998;14(4):547-555. doi:10.1016/S0749-0712(21)00416-9
4. Shafritz AB, Coppage JM. Acute and chronic paronychia of the hand. *J Am Acad Orthop Surg*. 2014;22(3):165-174. doi:10.5435/JAAOS-22-03-165
5. Lomax A, Thornton J, Singh D. Toenail paronychia. *Foot Ankle Surg*. 2016;22(4):219-223. doi:10.1016/J.FAS.2015.09.003
6. Shin JO, Roh D, Son JH, et al. Onychophagia: detailed clinical characteristics. *Int J Dermatol*. 2022;61(3):331-336. doi:10.1111/IJD.15861
7. Fowler JR, Ilyas AM. Epidemiology of Adult Acute Hand Infections at an Urban Medical Center. *J Hand Surg Am*. 2013;38(6):1189-1193. doi:10.1016/J.JHSA.2013.03.013
8. Dellinger EP, Wertz MJ, Miller SD, Coyle MB. Hand infections. Bacteriology and treatment: a prospective study. *Arch Surg*. 1988;123(6):745-750. doi:10.1001/ARCHSURG.1988.01400300091016
9. Chang P. Diagnosis using the proximal and lateral nail folds. *Dermatol Clin*. 2015;33(2):207-241. doi:10.1016/J.DET.2014.12.004
10. Houshian S, Seyedipour S, Wedderkopp N, Ellis M, Ain A. Epidemiology of bacterial hand infections. *International Journal of Infectious Diseases*. 2006;10:315-319. doi:10.1016/j.ijid.2005.06.009
11. Periungual Tissue Disorders. *A Text Atlas of Nail Disorders*. Published online March 6, 2021:125-176. doi:10.3109/9780203427200-10/PERIUNGUAL-TISSUE-DISORDERS-ROBERT-BARAN
12. Spiegel JD, Szabo RM. A protocol for the treatment of severe infections of the hand. *J Hand Surg Am*. 1988;13(2):254-259. doi:10.1016/S0363-5023(88)80060-1
13. Tomczak H, Dańczak-Pazdrowska A, Polańska A, et al. Microbiological analysis of acute infections of the nail fold on the basis of bait thread test. *Advances in Dermatology and Allergology/Postępy Dermatologii i Alergologii*. 2017;34(2):110. doi:10.5114/ADA.2017.67072
14. Durdu M, Ruocco V. Clinical and cytologic features of antibiotic-resistant acute paronychia. *J Am Acad Dermatol*. 2014;70(1). doi:10.1016/J.JAAD.2013.09.042
15. NASIR A, NASIR L. Counseling on Early Childhood Concerns: Sleep Issues, Thumb-Sucking, Picky Eating, School Readiness, and Oral Health. *Am Fam Physician*. 2015;92(4):274-278. Accessed May 5, 2024. https://www.aafp.org/pubs/afp/issues/2015/0815/p274.html
16. Milbar HC, Forrestel AK, Rubin AI. Acute Paronychia and Onychomadesis after a “Russian” Manicure: A New, Aggressive, and Destructive Form of Manicure for Dermatologists to Recognize. *Skin Appendage Disord*. 2022;8(6):497-499. doi:10.1159/000525023

17. Rabarin F, Jeudy J, Cesari B, et al. Acute finger-tip infection: Management and treatment. A 103-case series. *Orthopaedics & Traumatology: Surgery & Research*. 2017;103(6):933-936. doi:10.1016/J.OTSR.2017.03.024
18. HOCHMAN LG. Paronychia: more than just an abscess. *Int J Dermatol*. 1995;34(6):385-386. doi:10.1111/J.1365-4362.1995.TB04436.X
19. Ritting AW, O'Malley MP, Rodner CM. Acute Paronychia. *J Hand Surg Am*. 2012;37(5):1068-1070. doi:10.1016/J.JHSA.2011.11.021
20. Saul D, Roch J, Lehmann W, Dresing K. [Oberst's block anesthesia]. *Oper Orthop Traumatol*. 2020;32(1):18-22. doi:10.1007/S00064-019-00633-Y
21. Szinnai G, Schaad UB, Heininger U. Multiple herpetic whitlow lesions in a 4-year-old girl: case report and review of the literature. *Eur J Pediatr*. 2001;160(9):528-533. doi:10.1007/S004310100800
22. Pierrart J, Delgrande D, Mamane W, Tordjman D, Masmejean EH. Acute felon and paronychia: Antibiotics not necessary after surgical treatment. Prospective study of 46 patients. *Hand Surg Rehabil*. 2016;35(1):40-43. doi:10.1016/J.HANSUR.2015.12.003
23. Kapellen TM, Galler A, Kiess W. Higher frequency of paronychia (nail bed infections) in pediatric and adolescent patients with type 1 diabetes mellitus than in non-diabetic peers. *J Pediatr Endocrinol Metab*. 2003;16(5):751-758. doi:10.1515/JPEM.2003.16.5.751
24. Pierrart J, Delgrande D, Mamane W, Tordjman D, Masmejean EH. Acute felon and paronychia: Antibiotics not necessary after surgical treatment. Prospective study of 46 patients. *Hand Surg Rehabil*. 2016;35(1):40-43. doi:10.1016/J.HANSUR.2015.12.003
25. ROCKWELL PG. Acute and Chronic Paronychia. *Am Fam Physician*. 2001;63(6):1113-1117. Accessed May 6, 2024. https://www.aafp.org/pubs/afp/issues/2001/0315/p1113.html
26. Al-Qattan MM, Helmi AA. Chronic hand infections. *J Hand Surg Am*. 2014;39(8):1636-1645. doi:10.1016/J.JHSA.2014.04.003
27. Rigopoulos D, Gregoriou S, Belyayeva E, Larios G, Kontochristopoulos G, Katsambas A. Efficacy and safety of tacrolimus ointment 0.1% vs. betamethasone 17-valerate 0.1% in the treatment of chronic paronychia: an unblinded randomized study. *Br J Dermatol*. 2009;160(4):858-860. doi:10.1111/J.1365-2133.2008.08988.X
28. Tosti A, Piraccini BM, Ghetti E, Colombo MD. Topical steroids versus systemic antifungals in the treatment of chronic paronychia: An open, randomized double-blind and double dummy study. *J Am Acad Dermatol*. 2002;47(1):73-76. doi:10.1067/MJD.2002.122191
29. Litaiem N, Drissi H, Zeglaoui F, Khachemoune A. Retronychia of the toenails: a review with emphasis on pathogenesis, new diagnostic and management trends. *Arch Dermatol Res*. 2019;311(7):505-512. doi:10.1007/S00403-019-01925-W
30. Wollina U. Systemic Drug-induced Chronic Paronychia and Periungual Pyogenic Granuloma. *Indian Dermatol Online J*. 2018;9(5):293. doi:10.4103/IDOJ.IDOJ_133_18
31. García-Silva J, Almagro M, Peña-Penabad C, Fonseca E. Indinavir-induced retinoid-like effects: incidence, clinical features and management. *Drug Saf*. 2002;25(14):993-1003. doi:10.2165/00002018-200225140-00002
32. Keating GM. Ledipasvir/Sofosbuvir: A review of its use in chronic hepatitis c. *Drugs*. 2015;75(6):675-685. doi:10.1007/s40265-015-0381-2
33. Iorizzo M. Tips to treat the 5 most common nail disorders: brittle nails, onycholysis, paronychia, psoriasis, onychomycosis. *Dermatol Clin*. 2015;33(2):175-183. doi:10.1016/J.DET.2014.12.001
34. Haneke E. Nail psoriasis: clinical features, pathogenesis, differential diagnoses, and management. *Psoriasis (Auckl)*. 2017;7:51-63. doi:10.2147/PTT.S126281
35. Does A Vander, Gamret AC, Yosipovitch G. Nail Loss in Mild to Moderate Pemphigus Vulgaris. *Skin Appendage Disord*. 2022;8(6):504-507. doi:10.1159/000525462

36. Relhan V, Goel K, Bansal S, Garg VK. Management of Chronic Paronychia. *Indian J Dermatol*. 2014;59(1):15. doi:10.4103/0019-5154.123482
37. Roy B, Lipner SR. A Review of Nail Changes in Acrokeratosis Paraneoplastica (Bazex Syndrome). *Skin Appendage Disord*. 2021;7(3):163. doi:10.1159/000513828
38. Widya Monica P, Ishitsuka Y, Kawakita H, et al. Nail apparatus squamous cell carcinoma mimicking paronychia. *J Dermatol*. 2019;46(12):e460-e461. doi:10.1111/1346-8138.15084
39. Curtis KL, Lipner SR. Metastases to the nail unit and distal phalanx: a systematic review. *Arch Dermatol Res*. 2023;315(3):347-358. doi:10.1007/S00403-022-02411-6
40. Wöckel W, Meerbach W, Willnow U. [Metastasising squamous-cell carcinoma of the skin in a ten-year-old girl]. *Dtsch Med Wochenschr*. 1979;104(31):1104-1107. doi:10.1055/S-0028-1129048
41. Gupta AK, Baran R. Ciclopirox nail lacquer solution 8% in the 21st century. *J Am Acad Dermatol*. 2000;43(4 Suppl):S96-102. doi:10.1067/mjd.2000.109068
42. Bednar MS, Lane LB. Eponychial marsupialization and nail removal for surgical treatment of chronic paronychia. *J Hand Surg Am*. 1991;16(2):314-317. doi:10.1016/S0363-5023(10)80118-2
43. Sechi A, Zengarini C, Piraccini BM, et al. Treatment of retronychia: A systematic review and suggested treatment algorithm. *Dermatol Ther*. 2022;35(2). doi:10.1111/DTH.15251
44. Pabari A, Iyer S, Khoo CT. Swiss roll technique for treatment of paronychia. *Tech Hand Up Extrem Surg*. 2011;15(2):75-77. doi:10.1097/BTH.0B013E3181EC089E
45. Dulski A, Edwards CW. Paronychia. *The American Journal of Surgery*. 2023;36(1):362-365. doi:10.1016/S0002-9610(37)90847-X
46. Koshy JC, Bell B. Hand Infections. *J Hand Surg Am*. 2019;44(1):46-54. doi:10.1016/J.JHSA.2018.05.027
47. Watson PA, Jebson PJ. The natural history of the neglected felon. *Iowa Orthop J*. 1996;16:164. Accessed May 17, 2024. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2378126/
48. Dikhtyar A, Stack LB. Felon caused by foreign body. *Vis J Emerg Med*. 2021;24:101059. doi:10.1016/J.VISJ.2021.101059
49. Nardi NM, McDonald EJ, Syed HA, Schaefer TJ. Felon. *StatPearls*. Published online April 30, 2024. Accessed May 17, 2024. https://www.ncbi.nlm.nih.gov/books/NBK430933/
50. Rabarin F, Jeudy J, Cesari B, et al. Acute finger-tip infection: Management and treatment. A 103-case series. *Orthop Traumatol Surg Res*. 2017;103(6):933-936. doi:10.1016/J.OTSR.2017.03.024
51. Blumberg G, Long B, Koyfman A. Clinical Mimics: An Emergency Medicine-Focused Review of Cellulitis Mimics. *J Emerg Med*. 2017;53(4):475-484. doi:10.1016/J.JEMERMED.2017.06.002
52. Subramaniam S, Bober J, Chao J, Zehtabchi S. Point-of-care Ultrasound for Diagnosis of Abscess in Skin and Soft Tissue Infections. *Acad Emerg Med*. 2016;23(11):1298-1306. doi:10.1111/ACEM.13049
53. Adhikari S, Blaivas M. Sonography first for subcutaneous abscess and cellulitis evaluation. *J Ultrasound Med*. 2012;31(10):1509-1512. doi:10.7863/JUM.2012.31.10.1509
54. Tosti R, Ilyas AM. Empiric Antibiotics for Acute Infections of the Hand. *J Hand Surg Am*. 2010;35(1):125-128. doi:10.1016/J.JHSA.2009.10.024
55. Koshy JC, Bell B. Hand Infections. *J Hand Surg Am*. 2019;44(1):46-54. doi:10.1016/J.JHSA.2018.05.027
56. Langer MF, Grünert JG. [Diagnostic and therapeutic Problems in Paronychia and Felons]. *Handchirurgie, Mikrochirurgie, plastische Chirurgie : Organ der Deutschsprachigen Arbeitsgemeinschaft fur Handchirurgie : Organ der Deutschsprachigen Arbeitsgemeinschaft*

fur Mikrochirurgie der Peripheren Nerven und Gefasse : Organ der V. 2021;53(3):259-266. doi:10.1055/A-1472-2030
57. Franko OI, Abrams RA. Hand infections. *Orthop Clin North Am*. 2013;44(4):625-634. doi:10.1016/J.OCL.2013.06.014
58. Kilgore ES, Brown LG, Newmeyer WL, Graham WP, Davis TS. Treatment of felons. *The American Journal of Surgery*. 1975;130(2):194-198. doi:10.1016/0002-9610(75)90370-0
59. INFECTIONS OF THE HAND - TeachMe Orthopedics. Accessed May 17, 2024. https://teachmeorthopedics.info/infections-of-the-hand/
60. Mohler A. Herpetic whitlow of the toe. *J Am Board Fam Pract*. 2000;13(3):213-215. doi:10.3122/15572625-13-3-213
61. Saleh D, Yarrarapu SNS, Sharma S. Herpes Simplex Type 1. *StatPearls*. Published online August 28, 2023. Accessed May 19, 2024. https://www.ncbi.nlm.nih.gov/books/NBK482197/
62. Lewis MAO. Herpes simplex virus: an occupational hazard in dentistry. *Int Dent J*. 2004;54(2):103-111. doi:10.1111/J.1875-595X.2004.TB00263.X
63. Get the lowdown on ankle and foot ulcers. *Nursing (Brux)*. 2010;40(1):42-43. doi:10.1097/01.NURSE.0000365917.01384.E7
64. Lewis MAO. Herpes simplex virus: an occupational hazard in dentistry. *Int Dent J*. 2004;54(2):103-111. doi:10.1111/J.1875-595X.2004.TB00263.X
65. Browning WD, McCarthy JP. A Case Series: Herpes Simplex Virus as an Occupational Hazard. *Journal of Esthetic and Restorative Dentistry*. 2012;24(1):61-66. doi:10.1111/J.1708-8240.2011.00469.X
66. Lieberman L, Castro D, Bhatt A, Guyer F. Case report: Palmar herpetic whitlow and forearm lymphangitis in a 10-year-old female. *BMC Pediatr*. 2019;19(1). doi:10.1186/s12887-019-1828-5
67. Feder HM, Long SS. Herpetic Whitlow: Epidemiology, Clinical Characteristics, Diagnosis, and Treatment. *American Journal of Diseases of Children*. 1983;137(9):861-863. doi:10.1001/archpedi.1983.02140350035009
68. Lieberman L, Castro D, Bhatt A, Guyer F. Case report: Palmar herpetic whitlow and forearm lymphangitis in a 10-year-old female. *BMC Pediatr*. 2019;19(1):1-4. doi:10.1186/S12887-019-1828-5/FIGURES/2
69. Belongia EA, Goodman JL, Holland EJ, et al. An Outbreak of Herpes Gladiatorum at a High-School Wrestling Camp. *New England Journal of Medicine*. 1991;325(13):906-910. doi:10.1056/nejm199109263251302
70. Rerucha CM, Ewing JT, Oppenlander KE, Cowan WC. Acute Hand Infections. *Am Fam Physician*. 2019;99(4):228-236. Accessed May 19, 2024. https://www.aafp.org/pubs/afp/issues/2019/0215/p228.html
71. Gill MJ, Bryant HE. Oral acyclovir therapy of recurrent herpes simplex virus type 2 infection of the hand. *Antimicrob Agents Chemother*. 1991;35(2):382. doi:10.1128/AAC.35.2.382
72. Nikkels AF, Pièrard GE. Treatment of mucocutaneous presentations of herpes simplex virus infections. *Am J Clin Dermatol*. 2002;3(7):475-487. doi:10.2165/00128071-200203070-00004