Review Article

Diagnostic Utility of Onychoscopy: Review of Literature

Chander Grover, Deepak Jakhar
Department of Dermatology and STD, University College of Medical Sciences and GTB Hospital, New Delhi, India

Abstract

Onychoscopy is being increasingly used as a diagnostic modality for various nail diseases. Initial research had focused mainly on nail pigmentation and nailfold capillaroscopy; however, it is now being evaluated in various infectious and inflammatory nail disorders as well. The present review aims to summarize current knowledge about onychoscopic diagnostic criteria in nail diseases. The best level of evidence attached to each indication is mentioned to answer the pertinent question: How much can we rely on onychoscopy in confirming diagnosis of nail disease?

Keywords: Dermatoscopy of nail, dermoscopy of nail, nailfold capillaroscopy, onychoscopy

INTRODUCTION

There is a relative lack of diagnostic modalities which can be meaningfully used to diagnose nail disorders. Routine laboratory investigations such as potassium hydroxide examination and fungal cultures have low or variable positivity when used in the setting of nail disease as compared to skin disease.[1] Radiological imaging modalities (X-ray, ultrasound, and magnetic resonance imaging) are known to have significant limitations when used to diagnose nail diseases other than tumors.[2,3] Nail biopsy and diagnostic histopathology are not commonly used or routinely resorted to for nail diseases; various reasons being apprehensions in the mind of patients and clinicians alike.[4] In addition, though we may consider histopathology as the diagnostic gold standard, our knowledge of diagnostic histopathological features and criteria in the setting of nail disease is far from complete.

Onychoscopy (dermatoscopy of nail) has come of age.[5] This is a diagnostic modality which is increasingly being used and evaluated by onychologists across the world.[2] Its importance is partially due to the fact that an advent of various types of dermatoscopes has facilitated easier diagnostic use in nail diseases.[5,6] Initial studies mostly focused on nail pigmentation;[7] but as of now, onychoscopy has been evaluated in various nail diseases including infectious and inflammatory disorders.[6,8] An additional use is nailfold capillaroscopy (NFC), used in the evaluation of systemic disease.[9,10] The present review aims to summarize our current level of knowledge with respect to onychoscopic criteria of various nail diseases with an aim to understand if onychoscopy can replace nail biopsy in the coming future.

MATERIALS AND METHODS

For the purpose of this review, we conducted a PubMed search pertaining to articles published in the English language, using the keywords “onychoscopy”, “dermoscopy of nail”, “dermatoscopy of nail”, and “nail fold capillaroscopy”. The search yielded 12, 206, 220, and 107 indexed articles, respectively. Abstracts were studied and were classified into case reports, review articles and clinical studies of various types. It was seen that the most commonly studied onychopathies were nail fold capillaroscopic abnormalities in connective tissue diseases, melanonychia, onychomycosis, and nail psoriasis. The full text versions of relevant articles (the ones offering the highest level of evidence) were downloaded and carefully evaluated. Based on this, relevant levels of evidence (LoE) were assigned to each study/report, based on the scheme proposed by Oxford Centre for Evidence-Based Medicine (OCEBM) in 2011 as outlined in

Address for correspondence: Dr. Chander Grover,
Professor, Department of Dermatology and STD, University College of Medical Sciences and GTB Hospital, New Delhi - 110 091, India.
E-mail: chandergroverkubba76@gmail.com

How to cite this article: Grover C, Jakhar D. Diagnostic utility of onychoscopy: Review of literature. Indian J Dermatopathol Diagn Dermatol 2017;4:31-40.
Table 1. We attempted to assign the highest available LoE to the role of onychoscopy in an individual onychopathy.

**Nailfold Capillaroscopy (Level of Evidence-1)**

The proximal nailfold (PNF) is a unique location which has horizontally oriented capillaries. This fact is used for the evaluation of alterations in the microvascular architecture. Such alterations are known to be of diagnostic as well as prognostic significance. The use of onychoscopy thus offers a distinct advantage by helping us evaluate the PNF capillary architecture reliably at higher magnification. The conditions in which NFC has been found useful are summarized below.

**Raynaud’s phenomenon (Level of Evidence-1)**

NFC is a particularly useful diagnostic tool in differentiating primary Raynaud’s phenomenon (RP) from the secondary RP.[9,10] While the secondary RP is characterized by an abnormal capillary architecture, primary RP does not show any abnormal capillary changes.[9,10]

**Systemic sclerosis (Level of Evidence-1)**

Abnormal NFC changes are now included in the revised diagnostic criteria for systemic sclerosis (SSc) (the ACR/EULAR criteria).[12] The capillary abnormalities associated with system sclerosis are termed as the “scleroderma pattern” [Figure 1a and b]. Three distinct NFC patterns have been described in SSc [Table 2].[13]

**Dermatomyositis (Level of Evidence-4)**

NFC abnormalities in dermatomyositis have been defined by the presence of two or more capillary architectural changes in at least two nailfolds. The changes include capillary loop enlargement, capillary loss, disorganization of the normal distribution of capillaries, “bushy” capillaries, twisted enlarged capillaries, and capillary hemorrhages.[14] Although architectural changes may be similar to those seen in SSc, the changes are less severe and less extensive in dermatomyositis. Dermatomyositis patients have less of avascular areas, and giant capillaries; additionally, mean capillary density is higher in these patients than in those with SSc.

**Systemic lupus erythematosus (Level of Evidence-4)**

NFC findings in systemic lupus erythematosus are less sensitive and specific as compared to SSc. The various patterns of NFC defined in literature include morphologic changes in capillary loops and variability of capillary loop length.[15]

**Mixed connective tissue disease (Level of Evidence-4)**

Mixed connective tissue disease is characterized by the presence of dystrophic, extremely convoluted, branched capillary, sometimes termed a pseudoglomerular or bushy capillary formations.[16]

**Diabetes mellitus (Level of Evidence-5)**

Being a microangiopathy, diabetes mellitus has attracted the interest of researchers to study NFC changes associated with it. A significant number of patients have been shown to have changes in the capillary microvasculature as studied in the PNF.[17] [Figure 2].

**Melanonychia (Level of Evidence-2)**

Melanonychia is probably the most extensively studied entity by onychoscopy. The International Study Group on Melanonychia published the first ever evidence-based guidelines on the use of dermoscopy in the detection and management of nail pigmentation in 2013.[18] These were based on a number of studies which were reviewed.[7,19-27] The salient considerations proposed are summarized below:

**Table 1: A concise account of levels of evidence as proposed by Oxford Centre for Evidence-Based Medicine in 2011**

| Level 1 | Systematic review of cross-sectional studies with consistently applied reference standard and blinding |
| Level 2 | Individual cross-sectional studies with consistently applied reference standard and blinding |
| Level 3 | Nonconsecutive studies or studies without consistently applied reference standards |
| Level 4 | Case-control studies or “poor or nonindependent reference standard” |
| Level 5 | Mechanism-based reasoning |

*Adapted from: OCEBM LoE Working Group. The Oxford 2011 LoE. OCEBM: Oxford Centre for Evidence-Based Medicine, LoE: Levels of evidence

**Table 2: Patterns of capillary architectural alteration in systemic sclerosis**

| NFC patterns | Features |
|-------------|----------|
| “Early” pattern | Few giant capillaries, few capillary hemorrhages, relatively preserved capillary distribution with no loss of capillaries |
| “Active” pattern | Frequent giant capillaries, frequent capillary hemorrhages, moderate loss of capillaries, mild disorganization of capillary architecture, and absent or ramified capillaries [Figure 1a] |
| “Late” pattern | Irregular enlargement of capillaries, few or absent giant capillaries and hemorrhages, severe loss of capillaries with extensive avascular areas, disorganization of normal capillary array, and ramified capillaries [Figure 1b] |

NFC: Nailfold capillaroscopy

Figure 1: (a) “Active” pattern of systemic sclerosis showing capillary dilation, capillary drop out and disorganization of capillary architecture (×200). (b) “Late” pattern of systemic sclerosis showing hemorrhages, few giant capillaries, avascular areas, and disorganization of capillaries (×50)
Technique
There was no evidence or consensus regarding which instrument or light is likely to be the most effective. Polarized and nonpolarized, as well as contact and noncontact dermatoscopes can be used. The group suggested the use of the same instrument during follow-up of the patients, preferably at a magnification of ×10. The best immersion fluid suggested was ultrasound gel.

Patterns
The group agreed that dermoscopy is useful in distinguishing the presence of blood versus melanin, on the basis of the following features which constitute a step-wise algorithm, to be followed while evaluating pigment in the nail unit.

Subungual hemorrhages
This is suggested by a pattern of globules, with or without distal streaks. It could be composed of a range of colors varying from red to brown to black [Figure 3]. However, it was emphasized that a dermoscopic diagnosis of subungual hematoma does not rule out a coexisting nail tumor, especially melanoma.

Benign melanonychia
The group suggested that this can be due to either melanocyte activation or melanocyte proliferation. Benign melanonychia due to melanocyte activation (ethnic or drug induced) is suggested by a homogenous gray coloration with thin, longitudinal gray lines [Figure 4]. The color can however vary depending on the pigment location and nail plate thickness. A brown background, associated with regular parallel lines of identical color, spacing and width, suggests a benign lesion (a nevus or a lentigo) [Figure 5]. At the same time, it was reported that this regular pattern may not be observed in some cases, especially in children, and rarely even in adults.

Malignant melanoma
A brown background with longitudinal lines that are irregular in color, width, spacing, and parallelism is suggestive of malignant melanoma. The important point is the homogeneity of color and width of each individual longitudinal line. Individual lines showing irregularity in color or width along their length raises the suspicion of a melanoma. At the same time, melanoma in adults may often show a diffuse dark background with barely visible lines. The group agreed that a dark background with areas of different hues of pigmentation is suggestive of a melanoma even in the absence of irregular lines.[18]

Nail pigment origin
Dermoscopy of the distal edge can give a clue regarding the probable origin of pigmentation within the matrix. A pigmented band presenting on the dorsal part of the nail plate probably originates from the proximal nail matrix, [Figure 6] whereas a band presenting on the ventral aspect originates from distal matrix. The group agreed that this may not be a reliable marker, especially when the nail plate is thin or has very dark or very light pigment bands.

Nail fold
Dermoscopic examination of the PNF and hyponychium allows one to distinguish between benign nevi and nail melanoma (Hutchinson’s or micro-Hutchinson’s sign). In the end, the study group summarized that as of now, any decision regarding the need for excision should be based on established clinical criteria and not solely on dermoscopic criteria.[18]
**Onychomycosis (Level of Evidence-3)**

This is one of the most common nail disorders, and many studies have focused on this indication. The disorder is classified into five types based on the pattern of invasion of the nail unit, namely, distal lateral subungual onychomycosis (DLSO), proximal subungual onychomycosis, superficial white onychomycosis, endonyx onychomycosis, and total dystrophic onychomycosis (TDO). The main utility of onychoscopy is in differentiating onychomycosis from nail psoriasis and traumatic onycholysis. It has been reported that the following three features are seen most commonly in onychomycosis:

- Jagged proximal edge with spikes of onycholytic edge: the proximal edge of onycholysis shows jagged margins with spikes [Figure 7]. These jagged edges correspond to the fungal invasion in the nail plate. It is mostly seen in TDO and DLSO.
- Longitudinal striae/“Aurora borealis pattern”: it shows the presence of multiple striae of same or different colors (yellow, white, brown, etc.) within the onycholytic nail plate [Figure 8]. These correspond to the reflections of fungal colonies, invasion, and subungual debris. This is best seen in DLSO.
- Ruin pattern: indented areas are seen on the ventral nail (subungual keratosis), and there is distal pulverization characterized by thickening of the nail plate. This pattern is best seen in TDO [Figure 9].

There is a lack of comparative studies in this field using other dermatoses as controls. Nevertheless, these features have been corroborated by most of the published work in this field. Correlation with histopathologic evidence is also lacking.

Other reported onychoscopic features of onychomycosis include fungal melanonychia, seen as black-to-brown longitudinal/transverse bands. It can be differentiated from other causes of melanonychia due to its homogenous pigmentation and/or coarse granules or pigmented clumps with the pigmented lines. These granules and clumps correspond to the fungal colonies. It is also reported that the bands here are wider distally and narrow proximally. Dermatophytoma appears as round-shaped yellow-to-orange color patches in the nail plate connected by a narrow channel to the distal nail plate. Recently, “White streaks” has been proposed as a useful dermoscopic sign to differentiate DLSO from nail psoriasis. Other newly described onychoscopic feature is “distal irregular termination” which correspond to distal pulverization characteristic of thickening of nail plate in TDO. Onychoscopy has also been utilized as a tool to locate the best proximal site for mycological sampling.

**Nail Psoriasis (Level of Evidence-3)**

Onychoscopic features in psoriasis depend on whether the nail matrix and/or nail bed is involved with psoriasis. Onychoscopy permits a better visualization of features not visible to naked eye. This is in addition to valuable diagnostic features.
information about the disease gleaned from the vascular structures visualized in the PNF and hyponychia. The salient onychoscopic features of nail psoriasis are summarized in Table 3.

There have been a fair number of studies reporting the frequency of different onychoscopic changes in nails affected by psoriasis. In a study involving 68 patients, Yadav et al. reported nail pitting [Figure 10] to be the most common finding, followed by onycholysis [Figure 11]. Psoriatic onycholysis is bordered by a distinct erythema and the edge of onycholysis is relatively straight and not jagged. On the other hand, a recent study of 67 patients reported splinter hemorrhages [Figure 12] to be the most common finding followed by pitting and onycholysis. Onychoscopy also helps identify and delineate salmon patch better than naked eyes. [Figure 13].

The presence of onycholysis as a sole feature of nail disease is a fairly common scenario. In such cases, it becomes difficult to diagnose the etiology, if no other cutaneous clues are present. Onychoscopy is a valuable investigation in this scenario as it helps differentiate between the three most common causes of onycholysis [Figures 7 and, 11 and 14] as summarized in Table 4.

Nail Lichen Planus (Level of Evidence-5)

Not much work has been done on onychoscopy of nail lichen planus. The onychoscopic characteristics have been described in only 3 studies till now, and there have been no attempts to correlate them with clinical features or with histopathology. Even these limited studies have not followed a case–control format, neither have they studied large numbers of nails.

Nail involvement is seen in around 10% of cases of lichen planus. Because of its aggressive behavior, early diagnosis and management becomes necessary. Nakamura et al. described onychoscopic features in 11 patients with 79 affected nails and divided them into nail matrix and nail bed changes. Nail matrix changes included trachyonychia (40.5%) [Figure 15], pitting (34.2%) [Figure 16], pterygium (21.5%) and red lunula (3.8%); while nail bed changes included chromonychia (55.7%) [Figure 17], nail fragmentation (50.6%), splinter hemorrhages (35.4%), onycholysis (27.8%) and subungual keratosis (7.5%). Other features reported included paronychia (31.6%), longitudinal streaks and anonychia. They attempted to identify poor prognostic factors in the form of nail bed features and converging longitudinal streaks which they associated with a poor treatment response. No capillaroscopic changes were observed. Another study by Friedman et al. reported chromonychia, subungual hyperkeratosis, and onycholysis and nail plate destruction as being the onychoscopic features of nail lichen planus.

Tumors

Onychoscopy has been used for the evaluation of many tumors. However, the evidence available is only in the form of reports of a single case or a small series. The published reports are summarized below.

Onychomatricoma (Level of Evidence-5)

Onychomatricoma is a benign fibroepithelial tumor specific to the nail apparatus. The classical tetrad includes xanthonychia, ungual hyperkeratosis, splinter hemorrhages, and transverse plus longitudinal overcurvature of nail plate. The onychoscopic features of 34 cases have been described in a study by Lesort et al. They detailed the features in the form of longitudinal parallel white bands (81.8%), parallel lateral edges (96.9%), splinter hemorrhages (81.8%), dark dots (84.8%), nail pitting (93.9%) and thickening of the free edge (93.9%). Dermoscopic features were found to have less inter observer variability as compared to the clinical features.

Onychopapilloma (Level of Evidence-5)

Onychopapilloma is a benign tumor of the nail bed and distal matrix. It presents as longitudinal erythronychia, leukonychia...
Table 3: A summary of salient onychoscopic features of nail psoriasis

| Part of nail unit affected by psoriasis | Onychoscopic feature | Description |
|----------------------------------------|----------------------|-------------|
| Nail matrix                            | Pitting [Figure 10]  | Depressions are irregular in size and shape; sometime surrounded by a whitish halo[37] Indentations over nail plate, irregular in size and shape[30] Large, deep, and irregular distributed cupuliform depressions[39] |
|                                       | Leukonychia          | White irregular areas within the substance of nail plate[39] |
| Nail bed                               | Salmon patch [Figure 13] | Red to orange patch, irregular in size and shape[37] Red brown-colored area[38] Yellowish-red discoloration appearing as irregular translucent area[36] |
| Splinter hemorrhages [Figure 12]      | Onycholysis [Figure 11] | Area either homogeneously white or having longitudinal striations, often surrounded by reddish-to-orange proximal border[37] Reddish orange to brown color band separating the area of onycholysis from the normal nail (this feature helps differentiate psoriatic onycholysis from traumatic onycholysis)[38] Erythematous border encircling white onycholytic area[39] |
| Nail bed vessels [Figure 12]          | Capillary density and architecture | Fusiform dilatation of vessels surrounded by prominent halo, as seen close to the onychodermal band[38] |
| Proximal nail fold                     | Capillary density and architecture | Reduced capillary density[40-42] Reduced capillary density, drop outs, coiled vessels[43] |
| Hyponychium                            | Capillary architecture | Dilated and irregularly distributed long and tortuous capillaries[37] Dilated, tortuous, and glomerulus-shaped capillaries[39,44] Correlates with severity of disease[39,44] |
| Other findings                         | Pseudofiber sign     | Red-black filamentous structures located along the cuticle or underneath the distal free edge of hyponychium[39] |

Table 4: Salient onychoscopic features of common causes of distal onycholysis

| Etiology of onycholysis | Onychoscopic features |
|-------------------------|----------------------|
| Onychomycosis [Figure 7] | Longitudinal striae and jagged edges with spikes arising from the proximal edge of onycholysis |
| Traumatic onycholysis [Figure 11] | Proximal linear edge of onycholysis without stria or erythematous border |
| Nail psoriasis [Figure 14] | Proximal linear edge of onycholysis with an erythematous band surrounding the onycholysis |

or melanonychia, associated with splinter hemorrhages, and characteristic subungual keratotic mass with distal fissuring. Onychoscopic appearance has been described as a band appearing to originate from the lunula with a proximal convex border and few splinter hemorrhages within.[49] Tosti et al.[50] reviewed 47 cases onychoscopically, reporting red bands originating from the lunula along with splinter hemorrhages. Another characteristic dermoscopic feature of the distal edge is a keratotic subungual mass corresponding to streaks, seen in all the cases [Figures 18 and 19].[50]

Subungual glomus tumor (Level of Evidence-5)

Glomus tumor is an uncommon benign vascular hamartoma arising from the modified smooth muscle cells of the glomus body. Although histopathology remains the gold standard investigation for confirming the diagnosis, typical onychoscopic features have been described. Onychoscopy of nail plate reveals discrete linear vascular structures. Even more characteristic is the intraoperative appearance (after nail plate removal).[51] It shows the presence of ramified telangiectasias over blue background at the site of tumor. Tumor margin can be considered corresponding to the abrupt loss of telangiectasias at the periphery of the mass.[52] Duarte et al. reported an irregular bluish patch with irregular linear vessels on onychoscopy.[53] This can aid in localizing the tumor and delineating the surgical margins.[53] Another study reported the appearance of homogeneous white area of the nail plate and disappearance of the lunula.[54] Onychoschizia was seen

Figure 10: Multiple pits differing in shape and size over the nail plate in psoriasis. Pitting is better appreciated with nonpolarizing onychoscopy (×50)
involving the distal nail plate. Thatte et al. did UV light dermoscopy of glomus tumor which revealed a “pink glow,” which the authors suggested was because of the vascular nature of the tumor.

**Digital myxoid cyst (Level of Evidence-5)**
Onychoscopic features of myxoid cyst depend on the pressure applied on the lesion while doing the procedure. When no pressure is applied, vascular patterns in the form of linear, branched, or serpentine vessels are seen. On applying, pressure vascular pattern diminishes, and the lesion shows translucent bright white areas.

**Periungual pyogenic granuloma (Level of Evidence-5)**
A pyogenic granuloma in the periungual location may present as a diagnostic dilemma. Onychoscopic features described include a reddish homogenous area with white rail lines.

**Periungual warts (Level of Evidence-5)**
A distinct advantage offered by onychoscopy is in the recognition of warts in early stages of their evolution. This comes particularly handy in the periungual location where other differentials need to be ruled out. Multiple red-black dots corresponding to thrombosed vessels in the keratotic lesions are seen on onychoscopy, helping to differentiate from other tumors arising subungually.

**Periungual Bowen’s disease (Level of Evidence-5)**
This is again a difficult to diagnose disorder when arising in the periungual location. Onychoscopic features include islands of whitish scale and numerous, diffusely distributed red dotted vessels. The vessels have whitish halo and occur on a whitish-pink background. Nakayama et al. described the presence of these dotted vessels in 1 out of 3 patients with pigmented periungual Bowen’s disease. As compared to other body sites, there is a relative absence of glomerular/dotted vessels in the periungual location. This can be explained by the presence of a thick stratum corneum which obscures the visibility of vessels in the papillary dermis. Although Hutchinson’s sign is considered a useful marker of periungual melanoma, it has also been reported with periungual Bowen’s.

---

**Figure 11:** Distal onycholysis in psoriasis showing the typical erythematous band at the proximal end of onycholytic band (×50)

**Figure 12:** Onychoscopy of the nail bed showing longitudinal red-to-black-colored streaks indicating splinter hemorrhages (×50)

**Figure 13:** Multiple orange-to-red-colored area present in nail bed suggestive of salmon patch (×50)

**Figure 14:** Onychoscopy of traumatic onycholysis showing proximal linear edge without striae or erythematous band (×50)
disease. In this setting, it is known as pseudo-Hutchinson’s sign. This was reported in 1 out of 3 patients studied by Nakayama et al. The essential differences are summarized in Table 5.

**Digital fibrokeratoma (Level of Evidence-5)**
This is another relatively uncommon tumor arising mostly from underneath the PNF. Onychoscopy shows the presence of clumps of homogenous red lacunae divided by a white meshwork-like septal wall. Telangiectasias can be observed over the adjacent skin.

**Leukonychia (Level of Evidence-5)**
Leukonychia can be of diverse origins and multiple patterns. A transverse leukonychia of the toenails commonly results from repeated trauma to the distal nail plate from the shoes while walking. On onychoscopy, it shows one or more white transverse bands in the deep plate with a normal smooth nail plate surface. Bel et al. have reported the presence of longitudinal white streaks with variable thickness, originating from lunula in Hailey–Hailey disease. This is an important early sign of the disease.

**Conclusion**
Onychoscopy is a noninvasive and easily reproducible technique which has long been utilized in the study of nail pigmentation and NFC. It has produced consistent results in these conditions and has stood the test of time. Its application, however, in other onychopathies is still in developmental stages. The preliminary results are promising and controlled studies with larger sample size and higher power are needed to build up the evidence. Whether it can replace nail biopsy as a standard diagnostic tool or not, remains to be seen. Nevertheless, onychoscopy has carved out a niche for itself in the current diagnostic scenario.

**Financial support and sponsorship**
Nil.
Figure 19: Onychoscopy of distal edge of nail in onychopapilloma showing keratotic subungual mass (×50)

Table 5: Hutchinson’s sign and Pseudo-Hutchinson’s sign in the nail unit

| Hutchinson’s sign                          | Pseudo-Hutchinson’s sign                                      |
|------------------------------------------|----------------------------------------------------------------|
| Periungual extension of brown-black pigmentation | Periungual pigmentation seen in either of the following three situations |
| Arises from a band of longitudinal melanonychia and extends onto the proximal and lateral nailfolds | Bowen’s disease of nail unit |
| Seen in subungual melanoma                | Nail bed hyperpigmentation reflecting through transparent nail folds |
|                                           | Nail matrix hyperpigmentation reflecting through transparent nail folds |

Conflicts of interest

There are no conflicts of interest.

References

1. Shenoy MM, Teerthankar S, Karanakar VK, Girisha BS, Krishna Prasad MS, Pinto J. Comparison of potassium hydroxide mount and mycological culture with histopathologic examination using periodic acid-Schiff staining of the nail clippings in the diagnosis of onychomycosis. Indian J Dermatol Venereol Leprol 2008;74:226-9.
2. Thomas L, Vaudaine M, Wortsman X, Jemec GB, Drape J. Imaging the Nail Unit. In: Eds Baran R, de Berker DA, Holzberg M, Thomas L, editors. Baran & Dawber Diseases of the Nail Unit. In: Eds Baran R, de Berker DA, Holzberg M, Thomas L, editors. 4th ed. Wiley-Blackwell; 2012.p. 101-82.
3. Grover C, Khurana A, Jain R, Rathi V. Transungual surgical excision of Subungual Glomus tumour. J Cutan Aesthet Surg 2013;6:196-203.
4. Grover C, Chaturvedi UK, Reddy BS. Role of nail biopsy as a diagnostic tool. Indian J Dermatol Venereol Leprol 2012;78:290-8.
5. Grover C, Jakhar D. Onychoscopy: A practical guide. Indian J Dermatol Venereol Leprol 2013;83:536-49.
6. Lencastre A, Lamas A, SA D, Tosti A. Onychoscopy. Clin Dermatol 2013;31:587-93.
7. Ronger S, Touzet S, Ligeron C, Balme B, Viallard AM, Barrut D, et al. Dermoscopic examination of nail pigmentation. Arch Dermatol 2002;138:1327-33.
8. Nakamura RC, Costa MC. Dermatoscopic findings in the most frequent onychopathies: Descriptive analysis of 500 cases. Int J Dermatol 2012;51:483-5.
9. Mannarino E, Pasqualini L, Fedeli F, Scricciolo V, Innocente S. Nailfold capillaroscopy in the screening and diagnosis of Raynaud’s phenomenon. Angiology 1994;45:37-42.
10. Blockmans D, Beyens G, Verhaeghe R. Predictive value of nailfold capillaroscopy in the diagnosis of connective tissue diseases. Clin Rheumatol 1996;15:148-53.
11. Accessed from: http://www.cebm.net/wp-content/uploads/2014/06/CEBM-Levels-of-Evidence-2.1.pdf. [Last accessed on 2017 Oct 22].
12. Van den Hoogen F, Khanna D, Fransen J, Johnson SR, Baron M, Tyndall A, et al. 2013 classification criteria for systemic sclerosis: An American College of Rheumatology/European League against Rheumatism collaborative initiative. Arthritis Rheum 2013;65:2737-47.
13. Cutolo M, Sulli A, Pizzorni C, Accardo S. Nailfold videoangiocapillaroscopy assessment of microvascular damage in systemic sclerosis. J Rheumatol 2000;27:155-60.
14. Klyszcz T, Bogenschutze O, JO, Js M, Rassner G. Microangiopathic changes and functional disorders of nail fold capillaries in dermatomyositis. Hautarzt 1996;47:289-93.
15. Candela M, Pansoni A, De Carolis ST, Pomponio G, Corvetta A, Gabrielli A, et al. Nailfold capillaroscopy in patients with antiphospholipid syndrome. Recent Prog Med 1998;89:444-9.
16. Granier F, Vayssairat M, Priollet P, Housset E. Nailfold capillary microscopy in mixed connective tissue disease. Comparison with systemic sclerosis and systemic lupus erythematosus. Arthritis Rheum 1986;29:189-95.
17. Maldonado G, Guerrero R, Paredes C, Res C, RNailfold capillaroscopy in diabetes mellitus. Microvasc Res 2017;112:41-46.
18. Di Chiaccio ND, Farias DC, Piraccini BM, Hirata SH, Richert B, Zaiac M, et al. Consensus on melanonychia nail plate dermoscopy. An Bras Dermatol 2013;88:309-13.
19. Haas N, Hennz BM. Pinfall in pigmentation: Pseudopods in the nail plate. Dermatol Surg 2002;28:966-7.
20. Gencoglan G, Gereciker-Turk B, Kılınc-Karaarslan I, Akalin T, Ozmehir F. Dermoscopic findings in Laugier-Hunziker syndrome. Arch Dermatol 2007;143:631-3.
21. Causeret AS, Skowron F, Viallard AM, Balme B, Thomas L. Subungual blue nevus. J Am Acad Dermatol 2003;49:310-2.
22. Hirata SH, Yamada S, Almeida FA, Enokihara MY, Rosa IP, Enokihara MM, et al. Dermoscopic examination of the nail bed and matrix. Int J Dermatol 2006;45:28-30.
23. Imakado S, Sato H, Yamada K. Two cases of subungual melanoma in situ. J Dermatol 2008;35:754-8.
24. Antonovich DD, Grin C, Grant-Kels JM. Childhood subungual melanoma in situ in diffuse nail melanosis beginning as expanding longitudinal melanonychia. Pediatr Dermatol 2005;22:210-2.
25. Iorizzo M, Tosti A, Di Chiaccio N, Hirata SH, Misciali C, Michalany N, et al. Nail melanoma in children: Differential diagnosis and management. Dermatol Surg 2008;34:974-8.
26. Braun RP, Baran R, Saurat JH, Thomas L. Surgical Pearl: Dermoscopy of the free edge of the nail to determine the level of nail plate pigmentation and the location of its probable origin in the proximal or distal nail.
matrix. J Am Acad Dermatol 2006;55:512-3.
27. Bilemjian AP, Pioheiro-Maceira I, Barcaui CB, Pereira FB. Melanonychia: The importance of dermoscopic examination and of nail matrix/bed observation. An Bras Dermatol 2009;84:185-9.
28. Baran R, Hay RJ, Tosti A, Hanke E. A new classification of onychomycosis. Br J Dermatol 1998;139:567-71.
29. Piraccini BM, Balestri R, Starace M, Rech G. Nail digital dermoscopy (onychoscopy) in the diagnosis of onychomycosis. J Eur Acad Dermatol Venereol 2013;27:509-13.
30. Jesús-Silva MA, Fernández-Martínez R, Roldán-Marín R, Arenas R. Dermoscopic patterns in patients with a clinical diagnosis of onychomycosis-results of a prospective study including data of potassium hydroxide (KOH) and culture examination. Dermatol Pract Concept 2015;5:39-44.
31. De Crignis G, Valgas N, Rezende P, Leverone A, Nakamura R. Dermatoscopy of onychomycosis. Int J Dermatol 2014;53:e97-9.
32. Kilinc Karaarslan I, Acar A, Aytimur D, Akalin T, Ozdemir F. Dermoscopic features in fungal melanonychia. Clin Exp Dermatol 2015;40:271-8.
33. Yadav TA, Khopkar US. White streaks: Dermoscopic sign of distal lateral subungual onychomycosis. Indian J Dermatol 2016;61:123.
34. Jesus-Silva MA, Roldan-Marín R, Asz-Sigal D, Arenas R. Dermoscopy. In: Tosti A, Vlahovic T, Arenas R. (eds) Onychomycosis. Springer; 2017 p. 131-40.
35. Bet DL, Reis AL, Di Chiaccio N, Belda Junior W. Dermoscopy and onychomycosis: Guided nail abrasion for mycological samples. An Bras Dermatol 2015;90:904-6.
36. Tosti A, Piraccini BM, de Farias DC. Dealing with melanonychia. Semin Cutan Med Surg 2009;28:49-54.
37. Farias DC, Tosti A, Chiacci NO, Hirata SH. Dermoscopy in nail psoriasis. An Bras Dermatol 2010;85:101-3.
38. Yadav TA, Khopkar US. Dermoscopy to Detect Signs of Subclinical Nail Involvement in Chronic Plaque Psoriasis: A Study of 68 Patients. Indian J Dermatol 2015;60:272-5.
39. Yorulmaz A, Artuz F. A study of dermoscopic features of nail psoriasis. Postepy Dermatol Alergol 2017;34:28-35.
40. Ohtsuka T, Yamakage A, Miyachi Y. Statistical definition of nailfold capillary pattern in patients with psoriasis. Int J Dermatol 1994;33:779-82.
41. Zaric D, Clemmensen OJ, Worm AM, Stahl D. Capillary microscopy of the nail fold in patients with psoriasis and psoriatic arthritis. Dermatologica 1982;164:10-4.
42. Bhushan M, Moore T, Herrick AL, Griffiths CE. Nailfold video capillaroscopy in psoriasis. Br J Dermatol 2000;142:1171-6.
43. Ribeiro CF, Siqueira EB, Holler AP, Fahr Hol L, Skare TL. Periungual capillaroscopy in psoriasis. An Bras Dermatol 2012;87:550-3.
44. Iorioz M, Dadah M, Vincenzi C, Tosti A. Videodermoscopy of the hyponychium in nail bed psoriasis. J Am Acad Dermatol 2008;58:714-5.
45. Elfar NN, Abdel-Latif AM, Labeh EA. Role of onychoscopy in differentiation between distal subungual onychomycosis, psoriasis, and traumatic onycholysis. J Egypt Womens Dermatol Soc 2015;12:145-9.
46. Nakamura R, Broce AA, Palencia DP, Ortiz NI, Leverone A. Dermoscopy of nail lichen planus. Int J Dermatol 2013;52:684-7.
47. Friedman P, Sabbab EC, Marucci C, Peralta R, Cabo H. Dermoscopic findings in different clinical variants of lichen planus. Is dermoscopy useful? Dermatol Pract Concept 2015;5:51-5.
48. Lesot C, Debarbieroux S, Duru G, Dalle S, Poulhalon N, Thomas L. Dermoscopic features of onychomatricoma: A study of 34 cases. Dermatology 2015;231:177-83.
49. Jellinek NJ. Longitudinal erythronychia: Suggestions for evaluation and management. J Am Acad Dermatol 2011;64:167.e1-11.
50. Tosti A, Schneider SL, Ramirez-Quizon MN, Zaiaa M, Miteva M. Clinical, dermoscopic, and pathologic features of onychopapilloma: A review of 47 cases. J Am Acad Dermatol 2016;74:521-6.
51. Maehara Lde S, Ohe EM, Enokihara MY, Michalany NS, Yamada S, Hirata SH. Diagnosis of glomus tumor by nail bed and matrix dermoscopy. An Bras Dermatol 2010;85:236-8.
52. Rai AK. Role of intraoperative dermoscopy in excision of nail unit glomus tumor. Indian Dermatol Online J 2016;7:448-450.
53. Duarte AF, Correia O, Barreiros H, Hanke E. Giant subungal glomus tumor: Clinical, dermoscopy, imagiologic and surgery details. Dermatol Online J 2016;22. pii: 13050.qj667b8w.
54. Mutsaers ER, Genders R, van Es N, Kukuteh N. Dermoscopy of glomus tumor: More white than pink. J Am Acad Dermatol 2016;75:e17-8.
55. Thatte SS, Chikhalkar SB, Khopkar US. “Pink glow”: A new sign for the diagnosis of glomus tumor on ultraviolet light dermoscopy. Indian Dermatol Online J 2015;6 Suppl 1:S21-3.
56. Salerno G, Alonso C. Images in clinical medicine. Digital mucous cyst. N Engl J Med 2012;366:1335.
57. Salerno G, González R, Alonso C. Dermatoscopic pattern of digital mucous cyst: Report of three cases. Dermatology Practical and Conceptual 2014;4:65-7.
58. Yorulmaz A, Yalcin B. A Painful periungual red spot in a patient with onychodystrophy. Skin Appendage Disord 2017;3:67-69.
59. Piraccini BM, Bruni F, Starace M. Dermoscopy of non-skin cancer nail disorders. Dermatol Ther 2015;28. pii: 13030/qt66f7b8wt.
60. Giacomel J, Lallas A, Zalaudek I, Argenziano G. Periungual Bowen disease mimicking chronic paronychia and diagnosed by dermoscopy. J Am Acad Dermatol 2014;71:e65-7.
61. Nakayama C, Hata H, Homma E, Fujita Y, Shimizu H. Dermoscopy of periungual pigmented Bowen’s disease: Its usefulness in differentiation from malignant melanoma. J Eur Acad Dermatol Venereol 2016;30:552-4.
62. Baran R, Kechijian P. Hutchinson’s sign: A reappraisal. J Am Acad Dermatol 1996;34:87-90.
63. Hayashi K, Matori S, Kariya Y, Sonosaki T, Yamaguchi S, Hagiwara K, et al. Dermoscopic observation of acquired digital fibrokeratoma developed on the dorsum of the fourth left toe. J Dermatol 2016;43:107-8.
64. Bel B, Jeudy G, Valbe R. Dermoscopy of longitudinal leukonychia in Hailey-Hailey disease. Arch Dermatol 2010;146:1204.