



RESEARCH ARTICLE

NAILS: A WINDOW TO SYSTEMIC DISEASES

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ARTICLE INFO

Article History:

Received 20th March, 2018

Received in revised form

18th April, 2018

Accepted 27th May, 2018

Published online 30th June, 2018

Key words:

Nails, Systemic diseases,
Koilonychia, Onycholysis.

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Citation: Dr. Pooja, Dr. Vijay Kumar Vijayran, Dr. Mamta Malik, Dr. Sanjeev Laller and Dr. Navneet, 2018. "NAILS: A window to systemic diseases", *International Journal of Current Research*, 10, (6), 70591-70596.

ABSTRACT

Abnormal changes in nails can be due to diseases primarily affecting nails and some of these nail changes can be a presenting feature before other signs of a systemic disease become clinically evident. The purpose of this review is not to address localized trauma or nail infections but offers examples of nail abnormalities that may occur with systemic disease. This paper includes information on common nail changes like koilonychia, longitudinal and transverse grooves, nail pitting, clubbing, nicotine-stained nails, cyanosis, and jaundice, information on the -nychias (leuko-, pachy-, melano- and dyschromo-), onycholysis and onychoschizia, yellow nail syndrome, Terry's nails etc.

INTRODUCTION

Many of the nail abnormalities have been found to be associated with the systemic diseases. Nail examination makes a very important part of the general examination with which an oral diagnostician should also be familiar with. Examination of fingernails can help the clinician to detect a number of general and specific factors, including overall vitality, inner emotional state, cerebral dominance, occupation and hobbies, medical history, nutritional status and other systemic illness. Some nail changes can occur concomitantly with the changes in oral cavity or even before that. Thus Oral Diagnosticians must acquaint themselves with these nail changes as they can be a helpful clue in diagnosing systemic diseases (Motswaledi and Mayayise, 2010; Sheokand, 2014).

Nails Examination: Human fingernails, located on the dorsal aspect of the terminal 40% of the distal phalanx of each finger, are complex structures involving 3 different layers: the nail plate (the nail-keratinized structure, which grows throughout life), the nail bed (the vascular bed that is responsible for nail growth and support); and the eponychium (the epidermal layer between the proximal nail fold and the dorsal aspect of the nail plate). Examination of the nails is part of a full dermatological examination and nail changes may alert one to the diagnosis of

a systemic disease. Individual's manicure can reveal state of health, nutritional status, past events, personality, occupation, and one's inner state. Thus the examination of nails should be done critically in adequate light. The nail should be rotated gently in the light so that all the aspects of nail gets highlighted by reflection. It is always useful to follow the following sequence when examining the nails (Pratt and Kaplan, 2005; Dausber *et al.*, 1998):

- Check the nail shape
- Examine the nail color
- Survey processes around the nails
- Compare hands
- Note skin conditions

Before going to alteration in nails, one should always check to see whether the nails are normal by looking at softness and flexibility of free edge; shape and color; quality of paronychia tissue; and growth rate. Figure-1 shows the normal nail.

Significance of nail growth

Nail growth rate varies among different individuals and among the different digits of the same individual. It depends on the turnover rate of the nail matrix cells and is influenced by several physiologic and pathologic conditions. Nail growth rate is slow at birth, increases slightly during childhood, and usually reaches its maximum between the second and the third

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DOI: <https://doi.org/10.24941/ijcr.30862.06.2018>

decades of life. It sharply decreases after the age of 50 years. Conditions that have been associated with a slow growth rate include systemic illness, malnutrition, peripheral vascular or neurologic diseases, and treatment with antimetabolic drugs. An arrest of nail growth is a typical feature of yellow nail syndrome. Conditions that have been associated with accelerated nail growth include pregnancy, finger trauma, psoriasis, and treatment with oral retinoids or itraconazole. Due to their slow growth rate, the nails may provide information on pathologic conditions that have occurred up to several months before the time of observation (Tosti *et al.*, 2003).

Abnormalities of nails and systemic diseases

Abnormalities of Nail Shape: The most common abnormalities of nail shape are koilonychia and clubbing followed by pincer nail, macronychia and micronychia.

Koilonychia: (Greek: Koilos = hollow, Onyx = nail)

It is the spoon-shaped concavity of nails or presence of reverse curvature in the transverse and longitudinal axis which results in concave dorsal aspect of the nail (Figure-2). To determine whether a nail is spooned, perform the water drop test. Place a drop of water on the nail. If the drop does not slide off, then the nail shows sign of spooning. Koilonychia is commonly associated with iron deficiency anemia and haemochromatosis. The presence of koilonychia is an alarming sign for clinician to look for other signs of anemia and to do a full blood count and serum iron studies (Dausber *et al.*, 1998; Braunwald *et al.*, 2005).

Clubbing: It is bulbous enlargement of the distal segments of the fingers due to proliferation of connective tissue, particularly on the dorsal surface. The pathophysiology of clubbing says that when platelet precursors fail to become fragmented into platelets within the pulmonary circulation, they are easily trapped in the peripheral vasculature, releasing platelet derived growth factor and vascular endothelial growth factor, promoters of vascularity and this ultimately results in clubbing. To determine whether nails are clubbed, have the patient place both forefinger nails together and look between them. If you can see a small diamond space between them (Schamroth's window) then the nails are not clubbed (Schamroth's sign) (Sheokand, 2014; Spicknall *et al.*, 2005). 3 forms of geometric analysis can be checked for clubbing-

- 1) Lovibond's angle (found at the junction between the nail plate and proximal nail fold). Normally less than 160°. In clubbing, this is increased to over 180° (Figure-3).
- 2) Curth's angle (found at the distal interphalangeal joint). It is normally approximately 180°. This is less than 160° in clubbing. (Figure-4).
- 3) Schamroth's window. It is a small diamond space seen between when the patient place both the fingernails together. It is obliterated in clubbing and seen in normal individuals (Schamroth's sign) (Figure-5).

Causes of clubbing include: Lung cancer, sarcoidosis, Beryllium poisoning, pulmonary arteriovenous fistula, subacute bacterial endocarditis, gastrointestinal causes: inflammatory bowel disease, sprue, neoplasms (esophagus, liver, bowel), Hyperthyroidism (Motswaledi and Mayayise, 2010; Sheokand, 2014; Spicknall *et al.*, 2005): Pincer nail is a curved in growth of nail with bilateral penetration to the nail

folds and recently reported to be seen in end stage renal disease secondary to diabetes (Motswaledi and Mayayise, 2010; Kirkland and Sheth, 2009). Macronychia (too large nails) is seen in gigantism and Micronychia (too small nails) is seen in plexiform neuromas (Motswaledi and Mayayise, 2010).

Abnormalities of Nail Colour

Leukonychia Striae: These are white splotches or whitish discoloration of nails. In total leukonychia (Figure-6) all the nails are porcelain white; this is seen in chronic liver disease. In subtotal leukonychia the proximal two-thirds of the nail is white and this is caused by delay in keratin maturation. Transverse white lines are seen in systemic problems such as chemotherapy or poisoning (Motswaledi and Mayayise, 2010; Dausber *et al.*, 1998).

Cyanosis: It is bluish discoloration of the nails which can be central and peripheral types. Peripheral cyanosis is seen in cases of cold exposure, shock, congestive cardiac failure and peripheral vascular disease. Central cyanosis is seen in congenital heart diseases such as Tetralogy of Fallot. Both the varieties are seen in cardiogenic shock with pulmonary edema (Motswaledi and Mayayise, 2010; Braunwald, 2005; Tally and O'Connors, 2008).

Jaundice: Jaundice or icterus is a yellowish discoloration of nails which results due to deposition of bilirubin. Nails are only affected in severe cases (Motswaledi and Mayayise, 2010).

Nicotine-stained nails: Here yellow staining of the nails due to nicotine is seen in heavy cigarette smokers (Figure-7). These stains are usually but not always seen in patients with cigarette-smoking associated cardiovascular disease and other diseases such as lung cancer (Motswaledi and Mayayise, 2010; Sheokand, 2014).

Melanonychia: Here longitudinal or transverse brownish to black pigmentation of the nails are seen (Figure 8). It can occur usually in association with Lichen planus, drug therapy with minocycline and zidovudine (Motswaledi and Mayayise, 2010).

Splinter haemorrhages: Splinter haemorrhages are caused by haemorrhages of the distal capillary loop (Figure 9). These haemorrhages in nails and petechiae on the skin may occur in patients with Infective endocarditis. Other rare causes of splinter haemorrhages include vasculitis, as in rheumatoid arthritis, polyarteritis nodosa and anti-phospholipid syndrome. They can be due to nail trauma also, especially if seen distally (Motswaledi and Mayayise, 2010; Karchmer, 2005).

Terry's half and half nails: Here the nails are white proximally (edema and anemia) and normal distally, usually seen in liver cirrhosis, congestive cardiac failure and adult-onset diabetes mellitus (Motswaledi and Mayayise, 2010) (Figure 10).

HIV-associated dyschromonychia: Dyschromonychia is a change in nail and nail bed color and is a term generally applied to patients with increased nail pigmentation. Many patients with dyschromonychia in association with advanced human immunodeficiency virus (HIV) infection are seen (Motswaledi and Mayayise, 2010; Leppard, 1990; Levay *et al.*, 2005).

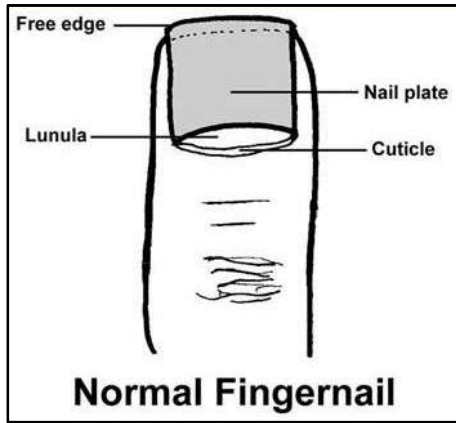


Figure-1: The Normal Nail



Figure 2. Spooned nail (Koilonychia)



Figure 3. Lovibond's angle



Figure 4. Curth's angle

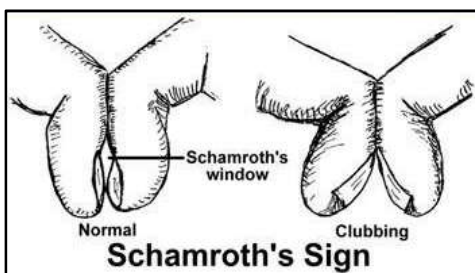


Figure 5. Schamroth's window and sign



Figure 6. Leukonychia (white discoloration of nails)



Figure 7. Nicotine-stained nails

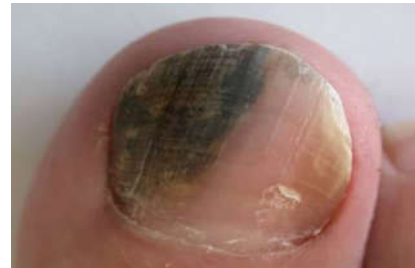


Figure 8. Melanonychia



Figure 9. Splinter haemorrhages



Figure 10. Terry's half and half nails

Yellow Nail Syndrome: In yellow nail syndrome the nails are yellow due to thickening, sometimes with a tinge of green, possibly due to secondary infection (Figure 11). It may be associated with lymphoedema at one or more sites and respiratory or nasal sinus disease (Motswaledi and Mayayise, 2010; Dausber *et al.*, 1998).

Green nails: Bacteria are not capable of attacking a healthy nail plate. The Gram-negative bacterium *Pseudomonas aeruginosa* may colonize the dorsal or ventral nail plate under propitious conditions, such as chronic paronychia or onycholysis. The presence of *Pseudomonas* is revealed by a characteristic green-black nail pigmentation due to pyocyanin staining (Tosti *et al.*, 2003).

Abnormalities of Nail Attachment

Onycholysis: It is defined as the distal or lateral separation of the nail plate from the nail bed with appearance of white or yellow areas of separation, due to air beneath the nail and sequestered debris. Onycholysis is reported to be commonly seen in certain skin diseases and other conditions like hypo and hyperthyroidism (Motswaledi and Mayayise, 2010; Sheokand, 2014).

Ptergium: It is seen in graft versus host disease and systemic sclerosis where a central fibrotic band divides a nail into two which obstructs the normal growth of nail (Motswaledi and Mayayise, 2010).

Abnormalities of Nail Surface

Longitudinal grooves: These are full or partial thickness grooves which run along the longitudinal axis of all or part of the length of the nail. Longitudinal grooves may be seen in patients with the use of oral retinoids or may be familial also (Motswaledi and Mayayise, 2010; Dausber *et al.*, 1998).

Transverse grooves: These are full or partial thickness grooves which run along the transverse axis of all or part of the length of the nail and reflects systemic disease such as coronary thrombosis, mumps and pneumonia (Motswaledi and Mayayise, 2010; Dausber *et al.*, 1998) (Figure 12)

Nail pitting: Nail pitting are punctuated erosions on the nail surface which can be shallow or deep having continuous or irregular outline (Figure-13). Nail pitting is common in skin diseases such as Psoriasis and Lichen planus (Motswaledi and Mayayise, 2010; Eisen, 1999).

Nail Beading: With nail beading, the beads seem to drip down the nail like wax. It is associated with endocrine conditions, including Diabetes mellitus, Thyroid disorders, Addison's disease and Vitamin B deficiency (Figure-14) (Sheokand, 2014).

Onychoschizia: It is defined as the transverse splitting of the nail plate into layers at or near the free edge in fingers and toes (Figure 15). And due to sequestration of debris between the layers, discoloration of nails is also seen. Onychoschizia has been reported in association with polycythemia (Motswaledi and Mayayise, 2010; Dausber *et al.*, 1998).

Rough Nail Surface: Sandpapered and dull appearance of nails is seen in patients of Psoriasis, Chemical exposure and Lichen planus (Sheokand, 2014).



Figure 11. Yellow nail syndrome



Figure 12. Transverse groove



Figure 13. Pitting



Figure 14. Nail Beading



Figure 15. Onychoshizia

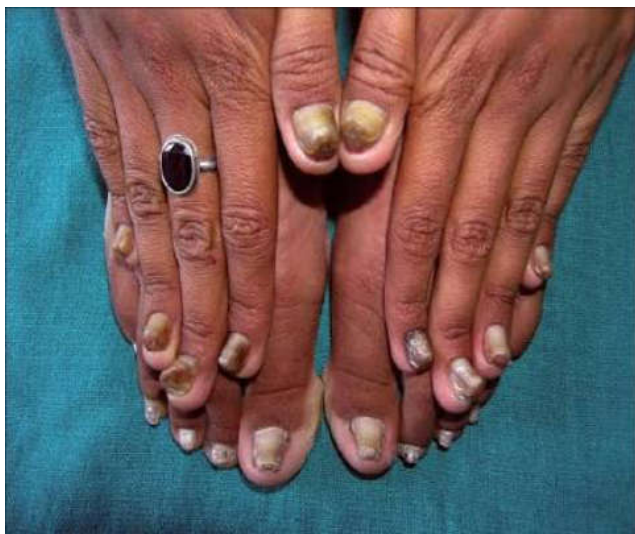


Figure 16. Pachyonychia congenita



Figure 17. Koenen tumour

Brittle nails: History of frequent immersion of hands in water is often associated with brittle nails. Other common causes are iron deficiency anaemia and impaired peripheral circulation (Motswaledi and Mayayise, 2010).

Genodermatoses With Nail Abnormalities

Localised areas of hyperkeratoses on the palm and soles with grossly thickened wedge shape nails (Figure-16) is seen in autosomal dominant rare genodermatosis known as Pachyonychia congenita. Oral lesions like leukokeratosis of the tongue, and oral mucosa, hoarseness due to involvement of

larynx are seen in Type-I whereas Type-II shows neonatal teeth and cutaneous cysts and hair abnormalities but without involvement of oral cavity (Tosti, 2003).

Koenen tumors (Figure-17) are seen in other rare autosomal dominant disease-tuberous sclerosis complex, as periungual fibromas that occur on the nails of the fingers and toes. Other cutaneous manifestations include adenoma sebaceum, which is pathognomonic of Tuberos sclerosis complex, ash leaf macules and shagreen patches (Motswaledi and Mayayise, 2010; Griffiths *et al.*, 1998; McKee *et al.*, 2005).

Conclusion

Examination of nails provide a helpful clinical road map of nail changes that may be associated with systemic disease and will be a helping hand to the clinician to identify and verify these clinical signs to act as an adjunct in proper and prompt diagnosis. Nail changes provide a window of opportunity as a profound knowledge of the associations may help in a complete and targeted work up of the patient.

“You can tell a lot from a person’s nail.....when a life starts to unravel, they are among the first to go..”

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