

# Nail changes and disorders among the elderly

Gurcharan Singh, Nayeem Sadath Haneef, Uday A

Department of Dermatology and STD, Sri Devaraj Urs Medical College, Tamaka, Kolar. India

Address for correspondence: Dr. Gurcharan Singh, 108 A, Jal Vayu Vihar, Kammanhalli, Bangalore-560043, India.

E-mail: gurcharan@vsnl.com

## ABSTRACT

Nail disorders are frequent among the geriatric population. This is due in part to the impaired circulation and in particular, susceptibility of the senile nail to fungal infections, faulty biomechanics, neoplasms, concurrent dermatological or systemic diseases, and related treatments. With aging, the rate of growth, color, contour, surface, thickness, chemical composition and histology of the nail unit change. Age associated disorders include brittle nails, trachyonychia, onychiauxis, pachyonychia, onychogryphosis, onychophosis, onychoclavus, onychocryptosis, onycholysis, infections, infestations, splinter hemorrhages, subungual hematoma, subungual exostosis and malignancies. Awareness of the symptoms, signs and treatment options for these changes and disorders will enable us to assess and manage the conditions involving the nails of this large and growing segment of the population in a better way.

**Key Words:** Nail changes, Nail disorders, Geriatric

## INTRODUCTION

Nail disorders comprise approximately 10% of all dermatological conditions and affect a high percentage of the elderly.<sup>[1]</sup> Various changes and disorders are seen in the aging nail, many of which are extremely painful, affecting stability, ambulation and other functions. The prevention and management of these conditions require periodic cutting of the nails and appropriate medical care. Unfortunately, these are difficult for the elderly because of thickness of the nails, difficulty in accessing the feet, poor vision and sometimes, lack of motivation for personal care. This article reviews the age associated nail changes and disorders along with related management.

## SENILE CHANGES IN NAILS

The senile changes in the nails are thought to result

from impaired peripheral circulation, commonly due to arteriosclerosis.<sup>[2]</sup> Though nail plate is an efficient sunscreen,<sup>[3,4]</sup> UV radiation may play a role in such changes. Trauma, faulty biomechanics, infections, concurrent dermatological or systemic diseases and their treatments are also contributory factors.<sup>[5,6]</sup> The following changes are observed in human nails as part of the aging process:

### a) Alteration in chemical composition

The calcium and iron contents of the aging nails are increased and decreased respectively.<sup>[2]</sup>

### b) Alteration in histology

The nail plate keratinocytes are increased in size, with increased number of 'pertinax bodies,' which are remnants of keratinocyte nuclei. The nail bed dermis shows thickening of the blood vessels and degeneration of the elastic tissue, especially beneath the pink part of the nail.<sup>[7]</sup>

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### c) Alteration in nail growth

Fingernails and toenails grow at an average rate of 0.1 mm/day (3.0 mm/month) and 0.03 mm/day (1.0 mm/month) respectively.<sup>[7]</sup> In the elderly, the rate of nail growth decreases by approximately 0.5%/year between 25 to 100 years of age.<sup>[8]</sup>

As observed by Oreintreich and Scharp (1967),<sup>[2]</sup> thumbnail growth decreases on an average by 38% between the third and the ninth decade. In this study, the decrease in growth of nails in females was greater up to the sixth decade; thereafter no change was observed till the eighth decade, whereas in males, the slowing was more pronounced from the sixth to the eighth decade.<sup>[2]</sup>

### d) Alteration in nail color

Senile nails may appear pale, dull, and opaque, with the color ranging from white (leuconychia) or yellow to brown or grey.<sup>[7]</sup> Leuconychia may be true (due to matrix involvement), which may be total, subtotal, transverse, punctate or longitudinal; pseudoleuconychia (of exogenous origin), seen in onychomycosis, and keratin granulations after nail enamel application; and apparent leuconychia (due to changes in the underlying tissue).

### The clinical presentations are varied like

- i) *Terry's nails*: The nails are colored white proximally and have a distal normal pink band of 0.5-3 mm width. These are seen in cirrhosis of the liver, chronic congestive heart failure, adult-onset diabetes mellitus and malnutrition.
- ii) *Half and half nails of Lindsay*: Seen in uremic patients, the nails have a proximal dull white area with the distal 20-60% portion brownish.<sup>[9]</sup>
- iii) *Muehrcke's paired, narrow white bands*: The bands are present parallel to the lunula. This is seen in hypoalbuminemia (less than 2.2g/100ml),<sup>[10]</sup> nephrotic syndrome, glomerulonephritis, malnutrition, acrodermatitis enteropathica<sup>[10]</sup> or following chemotherapy.<sup>[11]</sup>
- iv) The lunula may be decreased or absent altogether.<sup>[12,13]</sup>
- v) Neapolitan nails, which can be seen in up to 20% of the persons older than 70 years, are characterized by three bands similar to the colors of Neapolitan

ice-cream, i.e. a proximal white portion with absent lunula, a central normal pink band and an opaque distal free edge.<sup>[14]</sup>

### e) Alteration in contour

Senile nails usually have an increased transverse curvature and a decreased longitudinal curvature. Flattening of the nail plate (platyonychia), spooning (koilonychia), and pincer nail deformity (involution), are found more frequently.<sup>[8,15]</sup>

### f) Alteration in surface texture

Normally, the nails have a smooth surface. The senile nail may have increased longitudinal striations due to altered turnover rate of the matrix cells. The striations are termed "onychorrhexis" if they are superficial and "ridges" or "sausage-link ridges" or "beading" if deep.<sup>[7,8]</sup> Aging is the commonest cause of onychorrhexis.<sup>[10]</sup> Beau's lines (transverse ridges) and pitting are also found frequently.<sup>[16]</sup> The nails may be rough (trachyonychia) with splitting and fissuring.

### g) Alteration in thickness

Fingernails have a normal average thickness of 0.6 mm in males and 0.5 mm in females. Toenails are thicker, 1.65 ± 0.43 mm and 1.38 ± 0.2 mm in males and females respectively.<sup>[17]</sup> The nail plates of the thumb and great toe are the thickest, whereas the little finger has the thinnest nail plate. In the elderly, the nail plate thickness may increase, decrease or may remain unchanged.<sup>[7,8]</sup>

## NAIL DISORDERS AMONG THE ELDERLY

### a) Brittle nails (Fragilitas unguium)

The nail plate hardness is dependent on its state of hydration, the normal water content being 18% (10-30%). Nails become brittle when the water content is less than 16% and become soft when it is above 25%.<sup>[7]</sup> In persons older than 60 years, brittle nails are common, manifesting as excessive longitudinal ridges, roughness of the nail plate (trachyonychia), horizontal lamellar splitting of the distal nail plate (onychoschizia), and/or irregularity of the distal edge of the nail plate (Castle battlement appearance).<sup>[5,18,19]</sup>

Repeated cycles of hydration and dehydration, as occur in excessive domestic wet work or overuse of

dehydrating agents like nail enamels, nail enamel removers and cuticle removers, may precipitate brittle nails.<sup>[5,18,20]</sup> The first three fingers of the dominant hand are particularly susceptible.<sup>[18]</sup>

After elimination of the exacerbating factors, local measures should be undertaken to re-hydrate the nail plate, cuticle and the nail folds. This can be achieved by soaking the nails in lukewarm water for 10 to 20 minutes, followed by application of moisturizers such as lactic acid, urea, phospholipids or mineral oils, preferably under occlusion (cotton gloves or socks).<sup>[5]</sup> Oral biotin, iron, thiamine, cysteine, pantothenic acid, PABA, have been found to be effective.<sup>[6,21,22]</sup> In intractable cases, formaldehyde containing nail enamels can be helpful, which should be removed and reapplied not more than once a week.<sup>[5]</sup>

#### **b) Clubbing (Hippocratic nails/watch glass nails)**

Digital clubbing is said to be present if the angle between the normal nail plate and the skin of the finger at the proximal nail fold (Lovibond's angle) is less than 180°, usually close to 160°.<sup>[23]</sup>

Bilateral clubbing occurs generally (80%) due to cardiopulmonary disease. Disorders of the liver, gastrointestinal tract and kidney may also present with bilateral digital clubbing. Endocarditis, congestive heart failure, cirrhosis of the liver, ulcerative colitis and chronic pyelonephritis are the conditions commonly associated. Unilateral clubbing is seen in lymphadenitis, Pancoast tumor of the lungs and erythromelalgia. Unidigital clubbing occurs in vascular lesions of the same extremity like an aneurysm, arteriovenous fistula or peripheral shunt.<sup>[23]</sup> The syndrome of acquired hypertrophic pulmonary osteoarthropathy is a combination of clubbing, muscle weakness, joint pains, and swelling and hypertrophy of the upper and lower extremities. There is associated soft tissue proliferation, bone pain, proliferative periostitis and peripheral neurovascular disease. This condition occurs in association with a malignant thoracic tumor, especially bronchogenic carcinoma.<sup>[23]</sup>

#### **c) Onychodystrophies from faulty biomechanics and trauma**

Bony deformities of the digits or foot-to-shoe

incompatibility can cause faulty biomechanics leading to onychodystrophies such as nail plate hypertrophy (onychauxis), subungual corn (onychoclavus), ingrowing toe nails (onychocryptosis), onychogryphosis, onycholysis, subungual hematoma and subungual hyperkeratosis.<sup>[5,7]</sup>

Treatment should address the underlying bony deformity, foot care and appropriate footwear. Velcro shoes are convenient for the elderly. A molded shoe or an orthotic insert helps in non-surgical management of bony deformities.<sup>[5,7]</sup>

#### **d) Infections/Infestations**

The nail apparatus may get primarily infected or involved in infections of the adjacent structures.

Generally, onychomycosis is the commonest nail infection, accounting for 40% of all onychopathies and 30% of all cutaneous fungal infections.<sup>[24]</sup> The prevalence of onychomycosis increases with age, reaching nearly 20% in patients over 60 years.<sup>[25]</sup> It is especially common in the elderly, often involving both toenails and fingernails. The great toenail is the commonest one involved. The subtypes of onychomycosis are distal subungual onychomycosis (DSO, the commonest type), proximal subungual onychomycosis (PSO), white superficial onychomycosis (WSO) and candidal onychomycosis. The first three types are usually caused by dermatophytes such as *Trichophyton rubrum* and *Trichophyton mentagrophytes*. Non-dermatophyte molds, such as *Scopulariopsis brevicaulis*, *Hendersonula toruloidea* and *Scytalidium hyalinum*, are found more frequently in the elderly.<sup>[5]</sup>

In view of the prolonged duration of therapy, multiple drug interactions and side effects associated with the use of systemic therapies with griseofulvin and ketoconazole, topical antifungal therapy (e.g., ciclopirox lacquer)<sup>[26]</sup> is preferred in the elderly, although it provides only partial and symptomatic relief.<sup>[5]</sup> Short duration therapy or pulse therapy with itraconazole, terbinafine or fluconazole can be tried.<sup>[24]</sup> Terbinafine is the most preferred drug because of its superior mycologic cure rates and fewer drug interactions.<sup>[25]</sup> Nail avulsion can be employed for severe disease affecting only one or two nails.<sup>[5,7,27]</sup>



Paronychia (infection/inflammation of the nail fold) can be acute or chronic. Acute paronychia is a bacterial infection of the nail folds, usually caused by *Staphylococcus aureus* or *Pseudomonas* species. Most cases are trauma induced and involve only one nail.<sup>[24]</sup> Treatment is similar to that of other bacterial infections of the skin and involves draining of the abscess, warm saline soaks, systemic antibiotics and topical antibiotics such as 2% mupirocin ointment.<sup>[5,24]</sup> Severe infections, particularly those caused by *Pseudomonas*, may warrant nail avulsion.

Chronic paronychia, caused by *candida* species or gram negative bacteria (*Proteus* sp. or *Klebsiella* sp.), appears as red, swollen, boggy, tender nail folds with loss of cuticle and a patent proximal nail groove. Multiple transverse ridges may be seen in the nail plate.<sup>[5,24]</sup> Treatment is prolonged and includes keeping the nail folds and the surrounding skin dry, application of a topical antifungal or a topical antiseptic such as 4% thymol in alcohol and if necessary, excision of the chronic hypertrophic proximal nail fold. In cases with severe inflammation, topical or intra-lesional steroids can be used.<sup>[5,24]</sup>

*Sarcoptes scabiei* may inhabit the subungual hyperkeratotic debris, leading to persistent infestations or epidemics of scabies. The nails should be cut short and fingertips should be brushed with a scabicide in affected patients.<sup>[5]</sup>

Periungual warts are due to infection with human papilloma virus. These occur especially in persons receiving immunosuppressive therapy.<sup>[5,7]</sup>

The nails can be involved in leprosy, (93% in multibacillary vs 57% in paucibacillary), leading to dry, lusterless, narrow, shrunken nails with longitudinal ridging and subungual hyperkeratosis.<sup>[28]</sup> Onychomycosis occurs in 32% of these patients.<sup>[29]</sup> Clofazimine causes pigmentation of the nails.<sup>[29]</sup>

Nail changes in syphilis include dullness, brittleness, pitting, splitting (onyxis craquelé), onycholysis, elkonyxis, shedding, distortion, Beau's lines in secondary syphilis, and amber coloured nails, and paronychia in tertiary syphilis.<sup>[1,30,31]</sup>

#### e) Onychauxis/Pachyonychia

Onychauxis (localized hypertrophy of the nail plate) manifests as hyperkeratosis, discoloration, and loss of translucency of the nail plate, with or without subungual hyperkeratosis.<sup>[7]</sup> This may be complicated by distal onycholysis, pain, increased susceptibility for onychomycosis, subungual hemorrhage and subungual ulceration.<sup>[7]</sup>

Periodic partial or total debridement of the thickened nail should be done with the help of electric drills or burrs. Chemical (40% urea paste) or surgical avulsion may be needed. Permanent ablation with chemical (phenol) or surgical matricectomy may be required for recurrent and troublesome onychauxis.<sup>[5,7,32]</sup>

#### f) Onychogryphosis

This refers to enlargement and thickening of the nail plate, which appears "ram's horn-like" or "oyster-like", mostly involving the great toenail. The nail plate appears uneven, thickened and brown to opaque, often with multiple transverse striations and hypertrophy of the underlying nail bed. This is mainly due to infrequent cutting of the nails. Other etiologies include trauma, hypertrophy of the nail bed and bony deformities like hallux valgus.<sup>[5,7]</sup> The nail plate initially grows upwards and thereafter deviates laterally towards the other toes, the direction of growth being influenced by pressure from footwear and matrix activity. A few patients develop subungual gangrene due to pressure effects, especially in the presence of diabetes mellitus or peripheral vascular disease.<sup>[5,18]</sup>

In hemi-onychogryphosis, a condition mimicking onychogryphosis, the nail plate grows laterally from the beginning. This may be a complication of persistent congenital malalignment of the great toenails. This condition can be prevented by regular nail plate trimming and foot care.<sup>[5,18]</sup>

Treatment is required for cosmetic reasons and for complications like subungual gangrene. Conservative management is by filing the nail plate with an electric drill or burr with removal of subungual hyperkeratosis, and subsequent periodic trimming of the nail plate. Surgical or chemical nail avulsion, with or without matricectomy, can be employed in persons with a good

vascular supply.<sup>[5,7]</sup>

#### **g) Onychophosis**

This refers to localized or diffuse hyperkeratosis on the lateral or proximal nail folds, in the space between the nail folds and nail plate, and also subungually. It results from repeated minor trauma, and nail fold and adjacent soft tissue deformities such as nail fold hypertrophy, onychomycosis, onychocryptosis, xerosis, etc. The first and the fifth toes are commonly affected.<sup>[5,7]</sup>

Onychophosis can be prevented by the use of appropriate footwear to minimize pressure effects. It is treated by debridement of the hyperkeratotic tissue by means of keratolytics (urea 20%, lactic acid 12% or salicylic acid 6-20%), followed by application of emollients, thinning of the nail plate, packing of the nail and, if necessary, surgery.<sup>[5,7]</sup>

#### **h) Onychoclavus (Subungual heloma/corn)**

It is a hyperkeratotic process in the nail area, mostly under the distal nail margins, due to a bony deformity or abnormal foot function. It should be differentiated from subungual melanoma, subungual exostosis, a foreign body or an epidermoid cyst.<sup>[5,7]</sup> It can be enucleated by removing the corresponding section of the nail plate with excision of the hyperkeratotic tissue. Any bony abnormality should be corrected and modified footwear, protective pads or tube foam should be used to prevent recurrence.<sup>[5,7]</sup>

#### **i) Onychocryptosis (Ingrown nails)**

This condition results when part of the nail plate pierces the lateral nailfold. Three major types are known: over-curvature of the nail plate (pincer nail), subcutaneous ingrowing toenail and hypertrophy of the lateral nail fold. Clinically, it manifests as inflammation of the nail fold, often with granulation tissue formation, sepsis, pain and tenderness of the involved digit.<sup>[5,7]</sup>

The causes include improper cutting of the nails, external pressure due to ill-fitting footwear, long toes and other deformities, hyperhidrosis, poor foot hygiene, prominent nail folds, and presence of a spicule.<sup>[5,7]</sup> In the elderly with impaired arterial circulation and

sensation, infection and gangrene may supervene.<sup>[5]</sup>

Predisposing factors should be corrected. Any offending spicule should be removed.<sup>[15]</sup> The distal nail plate should be cut straight across, so that the curves of the nail plate are beyond the distal edge of the lateral nail fold. Placing a small wisp of cotton beneath the lateral free edge of the nail plate prevents ingrowing.<sup>[5,7]</sup> Warm soaks, topical and systemic antibiotics, with application of a silver nitrate stick or curettage to remove granulation tissue, can be done.<sup>[16]</sup> In severe and intractable cases, complete or partial avulsion of the ingrown nail and excision of the involved adjacent tissue (nail folds/nail bed) can be done.<sup>[6]</sup> Other options are a partial (lateral) matricectomy with phenol, stainless steel wire nail brace (orthonyx technique), and cryotherapy.

#### **j) Onycholysis**

Separation of the nail plate from the nail bed beginning distally and progressing to the proximal end may be idiopathic or due to trauma, impaired circulation.<sup>[16]</sup>

#### **k) Onychotrophia**

This condition presents as dystrophic fingernails and toenails showing triangular residual nail plates. This occurs as a component of Cronkhite-Canada syndrome (alopecia, nail defects and polyposis of the gastrointestinal tract).<sup>[33]</sup>

#### **l) Splinter hemorrhages and subungual hematoma**

Splinter hemorrhages, which are most common traumatic in the elderly, are black and located in the middle or distal third of the fingernail. In contrast, splinter hemorrhages induced by systemic disorders are red in color and proximal in location.<sup>[5,7]</sup>

Subungual hematomas, which are also traumatic, are red and painful when of recent onset, and dark blue and non-tender when old. Characteristically, these are carried forward with the growth of the nail, unlike pigmented lesions of the nail matrix or nail bed.<sup>[5,7]</sup> In a few patients, distal onycholysis with eventual auto-avulsion of the nail plate can occur. Acute lesions should be drained to relieve pressure, by piercing the nail plate with a needle or electric drill. In chronic cases melanoma should be ruled out.<sup>[5,7]</sup>

### m) Nail changes in some skin diseases

Nail involvement is very common in psoriasis and consists of pitting, onycholysis, discoloration (yellow or green) and thickening. Although psoriasis is the most common condition producing pitting, nail pits may also be seen in alopecia areata, eczema involving the digits, fungal infections and erythroderma.<sup>[16]</sup>

### n) Neoplastic nail conditions

Subungual exostosis is a benign, tender, nodular, hyperkeratotic bony proliferation most commonly involving the medial side of the great toe. This is associated with onychodystrophy/onychoclavus of the overlying nail.<sup>[34]</sup> Trauma and faulty biomechanics are the commonest causes in the elderly. It manifests as an inverted 'U' shaped nail plate due to hypertrophic nail bed, often with accentuation of the dorsal interphalangeal joint skin crease and onychocryptosis. It may lead to pincer nail deformity.<sup>[2,5]</sup> Treatment is by aseptic removal of the excess bone after radiographic confirmation.<sup>[2,5]</sup>

Myxoid pseudocysts (mucous cysts or periungual ganglion) are probably the commonest benign tumors. They are commoner in females and usually involve the proximal nail fold of fingers. These are asymptomatic, soft to firm, cystic/fluctuant, sometimes causing transverse nail depressions. They can be treated with intralesional injections of triamcinolone or surgical removal.<sup>[2]</sup>

Subungual melanoma, mostly affecting the great toe, is common in the elderly white population. The peak incidence was in eighth decade in one study.<sup>[2]</sup> Bowen's disease, squamous cell carcinoma, basal cell carcinoma and glomus tumor are also more frequent in this age group.

### o) Adverse effects due to nail cosmetics

Geriatric patients may show nail changes due to prolonged use of nail cosmetics. Nail polish may cause yellow-orange staining, superficial friability ("granulation") and brittleness of the nail plate. Allergic dermatitis due to nail polish can affect sites other than the nail, and also the spouse of the user. Metal pellets in the nail polish bottles may precipitate reactions due to nickel and onycholysis. Acetone containing nail

removers cause excessive dryness of the nail plate and paronychia. Sculptured artificial nails (methyl methacrylate), preformed plastic nails and stick on nail dressing may cause onychodystrophy, onycholysis, thinning, splitting and discoloration of the nail, nail fold dermatitis and loss of cuticle. Nail hardeners (formaldehyde) may cause subungual hemorrhage and bluish discoloration of the nail. Cuticle removers may cause irritation. Manicuring instruments may damage the nail.

The nails may also be affected by cosmetics used at other sites like hair removers, hair tonics and bleaching agents.<sup>[3]</sup>

### CONCLUSION

"The test of any civilization is the measure of consideration and care which it gives to its weaker members".

The elderly, who are one of the more vulnerable sections of our society, show various age related changes and disorders involving the nails. These may result in pain and interfere with their daily activities. The esthetic aspect of the nails is significant even in the elderly, as it may affect social as well as intra-family interactions. Awareness of the clinical conditions affecting nails in the geriatric age group and related management options is essential. This will help in reducing the psychological impact of nail disorders among the aged and improve their quality of life.

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