

The nail and ageing

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RESUMEN

Para la ciencia podológica/podiátrica es muy importante conocer los cambios de la lámina ungueal en el anciano debido a su de alta frecuencia. Los cambios de la uña asociados al envejecimiento incluyen un crecimiento ungueal más lento, modificaciones en el espesor de la uña, alteraciones en la superficie, alteraciones en su configuración y cambios en el color. Estas alteraciones son muy comunes debido al insuficiente aporte sanguíneo a zonas distales, pero también a los microtraumas de repetición y a la dificultad de estos individuos gerontes en el cuidados de las uñas de sus pies. El envejecimiento predispone al desarrollo o al empeoramiento de diversas enfermedades, como las onicomycosis, las uñas quebradizas, la onicogriposis, la paquioniquia, las uñas encarnadas, etc. Todas estas patologías pueden acontecer a cualquier edad, pero en la vejez hay una frecuencia más alta de su incidencia.

Palabras clave: Patología ungueal. Envejecimiento. Onicogriposis. Paquioniquia.

ABSTRACT

For podiatric science is very important to know nail changes in old people because of their high frequency. Nail changes associated with ageing include slower growth rate, thickness modifications, surface alterations, configuration abnormalities and color changes. They are most commonly due to impaired blood supply, but also to chronic microtrauma and difficulty for elderly people to take care of their nails. Ageing predisposes to the development or to the worsening of different diseases, such as onychomycosis, brittle nails, onychogryphosis, pachionychia, pincer nails. These may occur at any age, but in old age there is a higher frequency of incidence.

KEY WORDS: Nail disorders. Aging. Onychogryphosis. Pachionychia

ANATOMY OF THE NORMAL NAIL (1)

The nail plate is a fully keratinized structure made up of about 25 layers of tightly packed keratinocytes and produced by the germinative epithelium of the nail matrix.

The nail plate emerges from the proximal nail fold and progresses distally, tightly adhering to the nail bed. At the tip of the digit the nail plate detaches from the underlying tissues at the hyponychium. Proximally and laterally, the nail plate is surrounded by the nail folds, which protect the matrix from the environment. Nail plate production starts during fetal life and goes on continuously through life. Mean fingernail growth rate is 3 mm/month and toenail is 1 mm/month.

The nail plate is made up of three layers:

The dorsal nail plate, which is produced by the proximal portion of the nail matrix and is 0.08-0.1 mm thick, consisting of tight, flattened cells. This portion gives the nail hardness and sharpness.

The intermediate nail plate, which is produced by the distal matrix and is 0.3-0.5 mm thick, consisting of wide and irregular cells. This portion gives the nail flexibility and elasticity.

The ventral nail plate, which is produced by the nail bed and is 0.06-0.08 mm thick, consisting of keratinocytes derived from nail bed keratinization. This portion is necessary for the adhesion of the nail plate to the nail bed.

Toenails are usually thicker than fingernails. Normally fingernails are 0.5 mm thick and toenails 1.5 mm.

The distal portion of the nail matrix is visible through the transparent nail plate as a white distally convex half moon, the lunula. Above the lunula, the nail plate is thinner and consists only of the dorsal and intermediate portions.

Nail hardness is mainly due to high sulphur aminoacids, particularly cystine, and tight keratin cross-links. The keratin protein in nails is hardest at a slightly acid pH. Adhesion between cells is facilitated by membrane-coating granules with linkage by lipids.

Normal nails contain 5% lipids which can only be found in the dorsal and ventral portion of the nail plate and are organized in a bi-layer structure, parallel to the nail surface. Lipids fill certain ampullar dilations of the dorsal plate and intercellular spaces in the ventral plate. A low lipid content decreases the nail ability to retain water.

NAIL CHANGES ASSOCIATED WITH AGEING

Senile changes in the nail unit are most commonly due to impaired blood supply (diabetes and venous insufficiency), but also to chronic pressure and chronic microtraumas (improperly fitting shoes), feet deformations (hallux valgus, hammer finger), alterations in the elastic tissues, reduced tissue repairing. Microtraumas play an important role especially in the toenails (2).

Moreover, there are changes due to the difficulty of elderly people to take care of their nails, especially those of the feet. In old age, nail trimming may be difficult, the feet are difficult to reach and the poor vision do not help in periodic cutting.

Nail changes associated with ageing include (see Table I):

- slower growth rate
- thickness modifications
- surface alterations
- configuration abnormalities
- color changes

Beside these structural changes, ageing predisposes to the development or to the worsening of different diseases, such as onychomycosis, brittle nails, onychogryphosis, pachionychia, pincer nails. These may occur at any age, but in old age there is a higher frequency of incidence.

Table I Nail changes associated with ageing

slower growth rate	Onychomycosis
thickness modifications fingernails ↓ toenails ↑	Brittle nails Onychogryphosis Pachionychia
surface alterations	Longitudinal ridges Brittle nails
configuration abnormalities	Onychogryphosis Pincer nails
color changes	Yellow-brown with dull, opaque appearance « neapolitan nails » splinter haemorrhages

1. SLOWER GROWTH RATE

Nail plate growth rate gradually decreases with ageing, decreasing 0,5% per year between the age of 30 and 90 (3, 4). Factors that may influence the slower growth rate include impaired blood supply, actinic damage to the

nail matrix, hormonal changes and nutritional deficiency.

A reduced nail growth rate is considered a predisposing factor for onychomycosis (5).

Onychomycosis (6)

They are common in elderly, affecting up to 40% of people older than 70 years of age.

The increased prevalence of onychomycosis in the elderly has been attributed to two main factors: the slower growth rate, that favors infections and spreading of fungi, and the higher frequency of traumatic nail dystrophies which are considered predisposing factor for the disease. Diabetes mellitus, also common in the elderly, is another predisposing factor.

Toenails are affected more than fingernails with two main clinical presentations: distal subungual onychomycosis (DSO) and white superficial onychomycosis (WSO).

DSO is the most common type of onychomycosis and it is almost always caused by dermatophytes, especially *T. rubrum*. The skin of the palms and soles is frequently involved with plantar scaling.

Clinically the nail plate shows distal subungual hyperkeratosis and onycholysis. The onycholytic area appears yellow-white in colour. Proximal spreading frequently occurs along longitudinal streaks.

WSO affects only toenails. Most commonly the responsible fungus is *T. interdigitale*. The nail plate shows small white opaque patches that can be easily scraped off. Tinea pedis interdigitale is frequently associated.

2. THICKNESS MODIFICATIONS

With age, fingernail thickness decreases and toenail thickness increases. Nail plate thinning predisposes to brittle nails and nail plate thickness predisposes to onychogryphosis and pachyonychia.

Brittle nails (7)

Nail brittleness is a common complaint, affecting up to 30% of women over 50 years of age. It is characterized by nails that split, flake and crumble, becoming soft and losing elasticity.

Nail brittleness is due to an intrinsic defect in the intercellular cement that holds nail plate keratinocytes.

The increased frequency of nail brittleness in post-menopausal women may be caused by the reduction in the lipid content of the nail plate, which occurs after menopause. In particular, cholesterol sulphate content in the nail plate greatly decreases with age.

Environmental and occupational factors that produce progressive dehydration of the nail plate play an important role worsening the development of nail brittleness.

Onychogryphosis

It is typical of the big toenail of elderly people. Predisposing factors include trauma, ill-fitting shoes, impaired blood supply and poor foot care.

In onychogryphosis, the nail plate is thickened and uplifted since one side of the matrix grows faster than the other side (Fig.1). The side which grows faster determines the direction of the nail plate that is deformed with a ram's horn shape. The nail bed is usually hypertrophic.

The nail plate appear opaque, brown-colored and with surface transverse striations. Nail trimming is extremely difficult.

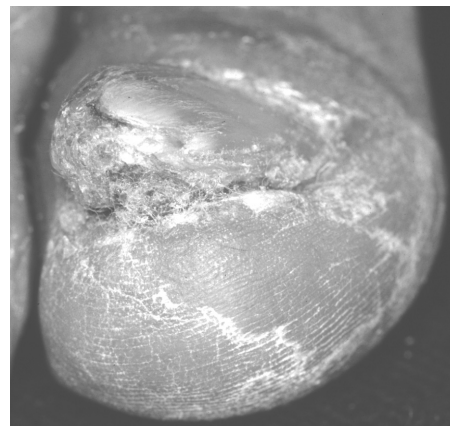


Fig.1 Thickened and uplifted nail plate due to onychogryphosis.

Pachyonychia

It is an hypertrophic nail dystrophy typical of old age. The nails are thickened with an increased transverse curvature due to severe nail bed hyperkeratosis. The nail plate is

opaque and yellow brown in color (Fig.2). Nail trimming is extremely difficult. Trauma and impaired blood supply are probable predisposing factors for this onychodystrophy.



Fig.2 Pachionychia.

3. SURFACE ALTERATIONS

They are especially evident in fingernails, which show parallel furrows separated by low projecting ridges (Fig.3). The pathogenesis of this condition is unknown, but it probably reflects an abnormal nail matrix kinetics due to ageing.

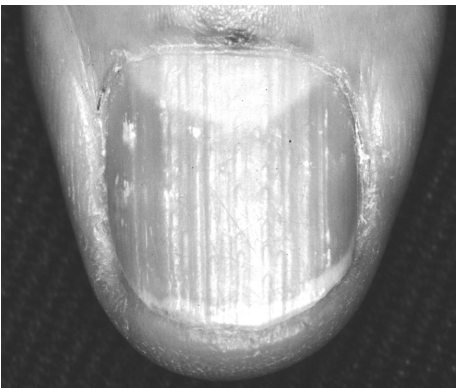


Fig.3 Longitudinal ridging with beading typical of old age.

Configuration abnormalities

Pincer nails (8)

They are characterized by transverse overcurvature of the nail plate that increases along the longitudinal axis of the nail towards

the tip. At the tip of the digit the nail plate pinches the soft periungual tissues constricting the underlying nail bed. This constant pressure is accompanied by pain. The nail plate is thickened and is frequently associated with subungual hyperkeratosis. Pincer nail are frequently precipitated or worsened by faulty bio-mechanic (i.e. tight shoes) and underlying pathologies (i.e. exostosis).

4. COLOR CHANGES

In old age the nails have a dull, opaque appearance and are frequently yellow in color. In 1982 Horan *et al.* (9) described the white nails of the elderly, called also «neapolitan nails», which presented in absence of underlying pathologies.

Splinter haemorrhages are commonly visible in the distal portion of the nail plate, due to nail bed capillary abnormalities. They are especially favored by traumas, anticoagulants intake and diabetes mellitus (10).

CONCLUSIONS

For podiatric science is very important to know nail changes in old people because of their high frequency. Old people represent in fact a large and growing segment of the population.

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