



A REVIEW ARTICLE ON ANTI-FUNGAL NAIL LACQUER USING TREATMENT OF NAIL INFECTION

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ABSTRACT

The purpose of review the paper of anti-fungal on nail lacquer which is used to treatment on Onychomycosis skin fungal disorder which focus on disease causes and treatment will have happened on nail lacquer, onychomycosis which caused by the pathogens including dermatophytes, candida and non-dermatophytes. Improvement clinical efficacy and also proper the patient's compliance. Nail Lacquer is the simple mixing non-volatile, gloss, smoothness to flow, drug diffusion studies drug content estimation, toenails of the human beings, Nail lacquer is used on fingernails. Which is protect the nail but the nail pate is all most significant by maximize the beauty, gloss, impart, colour. Nail lacquer are applicable to those drug which can prove bioavailability in oral formulation by this technique which is used in maximize the topical bioavailability on drug across the nail.

KEYWORD: Onychomycosis, nails, antifungal agents, nail lacquers.

INTRODUCTION

Topical delivery can be defined as the application of a drug containing formulation to the skin to directly treat cutaneous disorders or the cutaneous manifestations of a general disease. The care of toe nails is termed as *pedicure*. Recently nail tattoos are also very common among women. Over the last decades the treatment of illness has been accomplished by administering drugs to human body via various routes namely oral, parental, topical, inhalation etc. Every medical condition demands an accurate and appropriate treatment. As a matter of fact, the thought of resolving the patient's disease with

least harm done to the patient's health is said to be the basic goal of any therapy. The fingernail is important part of body as it plays remarkable role of protecting the finger from various injuries, since it is necessary to protect from various nail infections. The finger nail protects the fingertip and tissue from wounds and it helps for the exact developments of nail skin.

Nail Anatomy

The nails are composed of flat, horny scales which form protective covering for the distal of the finger & toes. Each nail consists of following parts.

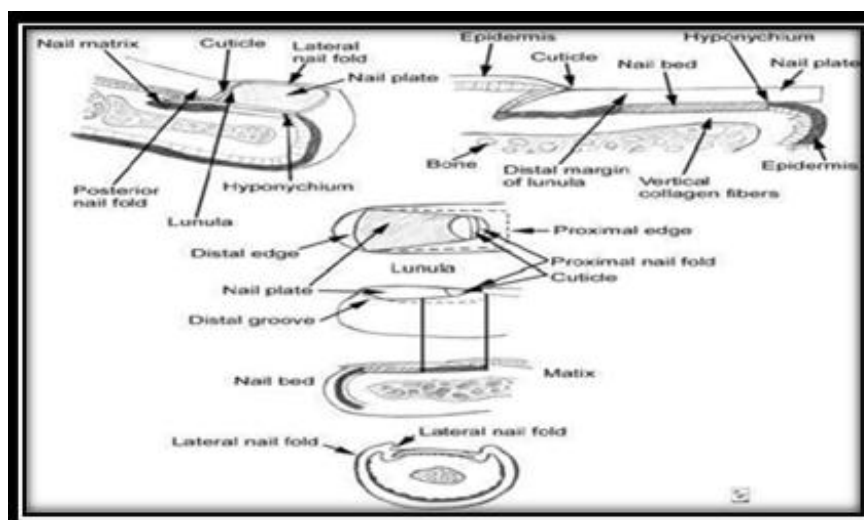


Fig. 1: Anatomy of Human Nail.

Matrix (matrix unguis, keratogenous membrane, nail matrix, onychostroma)

It is the tissue (or germinal matrix) upon which the nail rests the part of the nail bed that extends beneath the nail root and contains nerves, lymph and blood vessels.

Lunula ("The moon")

It is the visible part of the matrix, the whitish crescent-shaped base of the visible nail. the lunula is largest in the thumb and often absent in the little finger.

Functions of Nail

A healthy (finger) nail has the ability of securing the distal phalanx, the fingertip and the involving tissue from injuries. It also helps to enhance precise delicate movements of the distal digits through counter-pressure exerted on the mash of the finger. The nail then acts as a counter force when the end of the finger touches an object, thereby enhancing the sensitivity of the fingertip,

even though there are no nerve endings in the nail itself. (e.g. pulling out a splinter in one's finger).

Nail Growth & Regeneration

The nail plate is approximately 0.5 mm thick in females and 0.6 mm thick in males, and it tends to increase with age. The nail grows at a rate of approximately 1.8-4.5 mm per month or 0.1 mm per day; thus, the average nail can re-grow completely in 6-9 months. In certain conditions like stress or illness can detrimentally inhibit nail growth. Sometimes biting or short trimming of the nail can take longer time for growth.

Diseases and Disorders of Nails

The nail plate may seem not in normal as a conclusion of congenital defect, disease of dermis with attachment of the nail bed, systematic disease, minimize of blood supply, etc.

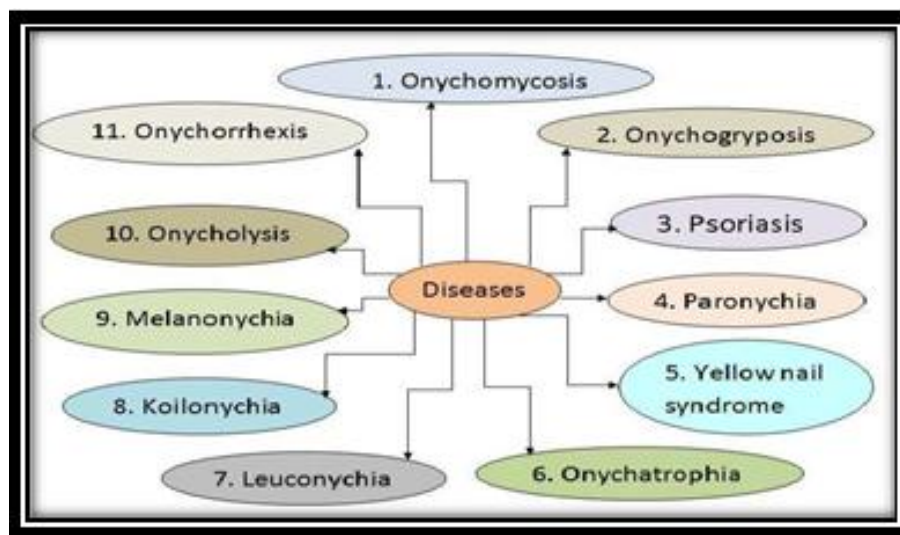


Figure 2: Diseases affecting to the nail.

ONYCHOMYCOSIS

Onychomycosis (*Tinea unguium*) is a fungal nail infection, which accounts for about 50% of nail disorders. It affects approximately 5% of the population worldwide. The meaning of onychomycosis is derived from the Greek language, namely onyx – a nail, mykes – a fungus. Onychomycosis is a common, chronic and hard to eradicate fungal disease of toenails and fingernails affecting 10- 30% of the population globally. Clinically onychomycosis presents with discoloration, thickening and irregular surface. It is responsible for approximately 50% of all nail disorders.

Clinical types of Onychomycosis

There are several clinical types of onychomycosis.

- a) DLSO – distal and lateral subungual onychomycosis
- b) SO – superficial onychomycosis (white or black)
- c) EO – endonyx onychomycosis

a. Subungual Onychomycosis

The most common form of *Tinea unguium* is distal subungual. Distal subungual onychomycosis may develop in the toenails, fingernails or both. The infection is usually caused by *Trichophyton rubrum*.

b. White Superficial Onychomycosis

White superficial onychomycosis accounts for only 10 percent of onychomycosis cases. White superficial onychomycosis is caused by certain fungi that directly invade the superficial layers of the nail plate and form well-delineated opaque “white islands” on the plate. As the disease progresses, these patches coalesce to involve the entire nail plate.

c. Endonyx Onychomycosis

Here the nail plate has a milky white discoloration; the nail does not separate from the bed (no onycholysis).



Fig 3: Endonyx Onychomycosis.

ONYCHOGRYPOSIS

Onychogryposis are claw-type nails that are characterized by a thickened nail plate and are often the result of trauma. This type of nail plate will curve inward, pinching the nail bed and sometimes require surgical intervention to relieve the pain.



Fig 4: Onychogryposis.

BEAU'S LINES

In this case nails that are characterized by horizontal lines of darkened cells and linear depression. This disorder may be caused by trauma, illness, malnutrition or any major metabolic condition, chemotherapy or other damaging event.

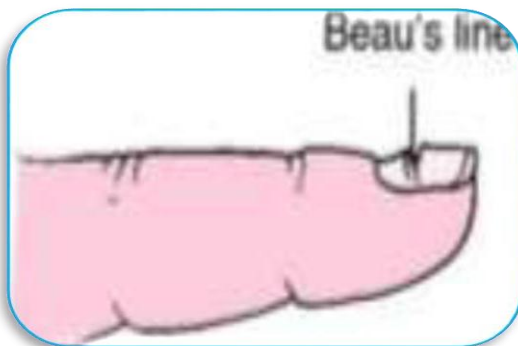


Fig 5: Beau's Lines.

Hematoma

It is due to the result of trauma to the nail plate. It can happen from simply trapping your finger or toe in the car door to friction from improperly fitting or 'too-tight' shoes, to a sports related injury. A hammer does a pretty good job at causing a hematoma as well. The nail bed will bleed due to this trauma, and the blood is trapped between the nail bed and the nail plate.



Fig 6: Hematoma.

Clinical Features

Dermatophytids are fungus-free skin lesions that sometimes form as a result of a fungus infection in another part of the body. This could take the form of a rash or itch in an area of the body that is not infected with the fungus. Dermatophytids can be thought of as an allergic reaction to the fungus.

Treatments of Onychomycosis

Several modalities can be used for the treatment of onychomycosis topical therapy, systemic therapy, combination therapy, and nail removal. Patients greater than 55 years of age may have a higher rate of relapse.

A Model Nail Lacquer Should Have The Following Properties.

- ❖ It should be convenient and easy to apply.

- ❖ It should form a satisfactory film on nails.
- ❖ It should be harmless to skin and nails.

To achieve satisfactory film, it should have the following characteristics.

- ❖ It should have sufficient flexibility so that it does not crack or become brittle.
- ❖ It should have reasonable drying time (1-2 minutes) without developing bloom.
- ❖ It should be able to maintain the above-mentioned properties for a reasonable time (about 1 week).
- ❖ It should have good wetting and flow properties so that the film formed is even.

MECHANISM OF NAIL LACQUER

The drug release through planar surface of unit area is governed by the Fick's law of diffusion¹²² and is defined by the following equation,

$$J = D \frac{dc}{dx}$$

Where,

D= diffusion coefficient of drug in film polymer

dc/dx= differences in concentration across diffusion path length of **dx**.

Drug dispersed in polymer acts as a matrix controlled release system. When nail lacquer is applied it will form a water insoluble film on nail plate after the evaporation of volatile organic solvent in few minutes. Film will contain the higher concentration of the drug when compared to original nail lacquer formulation.

Drug consisting nail lacquers are new formulation. Marketed formulation begins marketed in 1992 is clean colorless liquid and consists the antifungal amorolfine 5% eudragit RL 100 glycerol triacetate, butyl acetate, ethyl acetate and ethanol.

Factors Influencing Ungual Drug Deliver.

- ❖ Molecular size of compound /diffusing species.
- ❖ HLB of diffusing molecule or Hydrophilicity/lipophilicity of diffusing molecule.
- ❖ Nature of vehicle.
- ❖ pH of vehicle and solute charge.
- ❖ Presence of an intact dorsal layer.
- ❖ Binding of drug to keratin and other nail constituents.
- ❖ Presence of disease can alter the properties of nail.
- ❖ Thickness of the nail.

CONCLUSION

The purpose of the present investigation was to formulate and evaluate the Luliconazole nail lacquer as an unguinal drug delivery system for the treatment of nail infections. Conventional treatments for nail infections topically can clinically not efficient, as formulation must permeate the nail barrier in order to deliver therapeutic levels of active agents to the target site. Those formulations contain with nitrocellulose their drying time, non-volatile content and viscosity is more as

compare to other formulations. The percentage non-volatile content of FM8 formulation was found to be 40 ± 1.28 . FM8 formulation showed rapid drying rate. Optimized batch of nail lacquer FM8 showed high drug release i.e. 60.01%. The viscosity of FM8 formulation was observed as 149, so this formulation was clear and glossy. 60.01% of drug content was found in FM8. So a good therapeutic outcome can be expected. From the above studies, it can be concluded that medicated nail lacquers proved to be a better tool as a drug delivery system for the unguinal drug delivery of an antifungal in the treatment of nail infections.

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