EXAMINATION OF FINGERNAIL PLATES BY MEANS OF POLARIZED LIGHT VIDEOMICROSCOPY

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Synopsis
Examination of fingernail ridges or plates by means of polarized light has been performed using metallographic microscopes, stereomicroscopes and microscopes specifically designed for firearm and toolmark studies. All of these techniques require the drawing of nail specimens and their adequate preparation. To the best of our knowledge a polarized light videomicroscope has never been employed.

Material and methods.
The apparatus (Moritex Video Microscope System Scopeman, MS-S04, Meisei Bldg., Japan) is composed of a processing unit and a color monitor (14"TTL CVS); light from the light source (a 100W mercury vapour lamp) of the processing unit is guided with the optic fiber to the probe end. Objectives are equipped with non contact lens (from 1x to up 400x) and with contact lens (from 50x to up 1000x). The application of a light polarized objective x50 allows us to obtain perfect images of the surfaces. Fragile and brittle nails were evaluated. Furthermore some pathologies such as psoriasis, lichen planus, and rheumatoid arthritis were included in the study. Observations were made by polarized light and, for comparison, by videomicroscope with a normal objective.

Results.
This technique has allowed early detection some of changes in nail plates such as onycoschizia, longitudinal and transverse lines, pits, nail beading when they were scarcely evident to the naked eye and to a normal objective. We believe that also in the field of cosmetic dermatology this technique will be very useful for example in the study and therapy of brittle and fragile nails and in the evaluation of new hair cosmetics.

Riassunto
Una delle tecniche impiegate per lo studio delle lame ungueali e dei capelli è rappresentata dall’osservazione a luce polarizzata che sfrutta la birifrangenza della cheratina. All’uopo sono stati impiegati stereomicroscopi e microscopi metallografici. A quanto ci consta, non è mai stato utilizzato un videomicroscopio a sonda ottica dotato di obiettivo a luce polarizzata.

Materiali e metodi.
L’apparecchio è un Video-microscopio a sonda ottica, (Moritex Video Microscope System Scopeman, MS-504, Meisei Bldg., Japan); si tratta di un sistema di “Video-imaging” microscopico costituito da una telecamera, da una sonda ottica e da un monitor a colori ad alta definizione (14”TTL CVS). È dotato di obiettivi intercambiabili, con lenti a contatto (da 50x a 1000x) e non a contatto.
Examination of fingernail plates by means of polarized light videomicroscopy

(From l x to 400x). It is compatible with a videorecorder, printer and computer. The polarized light objective used allows magnification of 50x. Subjects with fragile nails and individuals affected by psoriasis, lichen, and rheumatoid arthritis were studied. For comparison, the samples were also observed with a non-polarized light objective.

**Results**

At non-polarized light, the surface of the samples appears virtually transparent. The polarized light objective permitted the following:

- The presence of vertical and transversal furrows;
- The "pitting" psoriasico, even when the lesions were not clinically evident;
- The "raindrop" alterations (nail beading) in the course of rheumatoid arthritis.

This non-invasive and easy technique can be useful to demonstrate the presence of ungueal alterations that are still clinically not evident, and in the evaluation of the effect of cosmetics on nails and hair.

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Introduction

Diagnostic techniques to evaluate nail disorders include KOH examination for fungal hyphae, cultures for bacteria and fungi and nail unit biopsy. Onychology research has also resulted in technological advances such as x-ray microanalysis to determine nail plate composition and ultrasonography to evaluate thickness (1). More recently, optical profilometry after nail shadowing has been introduced as a new technique to quantify nail surface alterations (2). Examination of fingernail ridges or plates by means of polarized light has also been performed using metallographic microscopes, stereomicroscopes and microscopes specifically designed for firearm and toolmark studies (3). All of these techniques require the drawing of nail specimens and their adequate preparation. We have employed a non invasive method to investigate fingernail plates: the polarized light videomicroscopy (PLVM) (4).

Material and methods

Material

Video-microscopy is an extension of traditional epiluminescence microscopy. Using a fiber optic camera, magnifications from 1 up to 1000x may be obtained so that the possibilities of study are greatly enhanced. In our Clinic we employ a video-imaging system, "Hand-Held Video Microscope Imaging System" by which both cutaneous pigmented lesions and superficial microvasculature may be investigated. The apparatus (Moritex Video Microscope System Scopeman, MS-504, Meisei Bldg., Japan) is composed of a processing unit and a color monitor (1 4"TTL CVS-), light from the light source (a 100W mercury vapour lamp) of the processing unit is guided with the optic fiber to the probe end. Objectives are equipped with non contact lens (from 1x to up 400x) and with contact lens (from 50x to up 1000x). A still video recorder and a colour printer may be attached.

The quality of the recorded images is, however, lower than those seen on the screen. The instrument is usually employed in the metal industry for the evaluation of corrosion and in the artistic field for the study of the deterioration of works of art. It is also used in mechanics, electronics and aviation. The application of a light polarized objective x50 allows us to obtain perfect images of the surfaces with an optical effect very similar to scanning electron microscopy (SEM). Furthermore, crossed polarizing filters of the objective display bands of interference colors as a consequence of the birefringence of keratin.

Methods

Fingernail plates of housewives and aged people were evaluated. Furthermore some pathologies such as psoriasis, lichen planus, and rheumatoid arthritis were included in the study (Table 1). Observations were made by PLVM and, for comparison, by videomicroscope with a normal objective.

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Results

PLVM has allowed early detection some of changes of nail plates such as onycoschizia, longitudinal and transverse lines, pits, nail beading when they were scarcely evident to the naked eye and to a normal objective (Figg. 1a,1b; 2a,2b; 3a,3b). We have obtained "tridimensional" images very similar to those of SEM. In colour photographies, the birifrangenze of keratin is also evident. The bands of different colours indicate regions of different thickness in the nail.

Fig. 1a - Pitting in psoriasis (Videomicroscopy, normal light, x50)

Fig. 1b - Pitting in psoriasis (Videomicroscopy, polarized light, x50)

Fig. 2a - Nail beading in rheumatoid arthritis (Videomicroscopy, normal light, x50)

Fig. 2b - Pitting in psoriasis (Videomicroscopy, polarized light, x50)
Discussion

PLVM is a non invasive technique which allows us to investigate, in vivo, nail plates and hairs without drawing of specimens. This may be very useful when the effects of a prolonged therapy must be evaluated. The numerous magnifications are useful in detecting very small lesions not yet visible to the naked eye. We believe that also in the field of cosmetic dermatology this technique will be very helpful, for example, in the study and therapy of brittle and fragile nails and in the evaluation of new hair cosmetics.
References