

ORIGINAL ARTICLES

## Diagnostic Utility of Nail Biopsy: A Study of 15 Cases

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**Abstract.** *Introduction.* Nail biopsy is thought to be a useful technique for the diagnosis of diseases affecting the nail apparatus and may help avoid delays in the diagnosis of important mucocutaneous diseases. Furthermore, it has therapeutic value in its own right. It is not a difficult technique to perform but it requires an in-depth knowledge of the anatomy and physiology of the nail unit, as well as surgical experience and patient collaboration. In order to assess the diagnostic utility of this technique, we reviewed the nail biopsies performed in our department between June 2005 and May 2006.

*Patients and methods.* We identified 15 patients in whom nail biopsy had been performed. The clinical findings, type of biopsy performed, and histopathologic diagnosis were assessed.

*Results.* Nail biopsy allowed diagnosis of a variety of skin disease in 13 out of 15 patients (psoriasis in 5, onychomycosis in 4, melanonychia in 2, melanoma in 1, and subungual hematoma in 1). None of the patients presented sequelae as a result of the intervention after several months of follow-up.

*Conclusion.* Nail biopsy is a useful tool in cases in which the patient history, clinical presentation, and additional tests have not led to a definitive diagnosis. In our experience, it can be performed safely and with minimal scarring.

**Key words:** nail biopsy, nail diseases, onychomycosis, nail psoriasis.

### LA BIOPSIA UNGUEAL: UN MÉTODO DIAGNÓSTICO DE GRAN UTILIDAD. ESTUDIO DE 15 CASOS

**Resumen.** *Introducción.* La biopsia ungueal se considera una técnica útil en el diagnóstico de los procesos patológicos que afectan al sistema ungueal y que permite evitar el retraso en el diagnóstico de procesos cutáneo-mucosos y anexiales importantes. Además, tiene por sí misma un valor terapéutico. No es una técnica difícil de realizar, pero requiere un completo conocimiento de la anatomía y la fisiología ungueal, así como de experiencia quirúrgica y colaboración del paciente. Con el objetivo de evaluar la utilidad diagnóstica de esta técnica hemos revisado las biopsias ungueales realizadas en nuestro servicio desde junio de 2005 hasta mayo de 2006.

*Pacientes y métodos.* Se incluyó a 15 pacientes a los que se les realizó una biopsia ungueal. Se valoraron los aspectos clínicos de la patología, el tipo de biopsia realizada y el diagnóstico histopatológico.

*Resultados.* La biopsia ungueal permitió un diagnóstico de diversas patologías cutáneas en 13 de los 15 pacientes (5 psoriasis, 4 onicomycosis, 2 melanoniquias longitudinales, 1 melanoma y 1 hematoma subungueal). Ninguno de los pacientes presentó secuelas de la intervención tras varios meses de seguimiento.

*Conclusión.* La biopsia ungueal es una herramienta útil en aquellos procesos en los que por la historia, la clínica y los estudios complementarios no se haya podido establecer un diagnóstico exacto. Según nuestra experiencia puede ser realizada de forma segura y con un mínimo daño cicatricial.

**Palabras clave:** biopsia ungueal, enfermedades ungueales, onicomycosis, psoriasis ungueal.

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### Introduction

As well as their esthetic function, nails play a physiologic role in protecting the fingers and increasing their accuracy of movement and tactile sensitivity. While nail diseases generally receive little attention from general physicians,

**Table 1.** Indications and Type of Nail Biopsy by Affected Area<sup>a</sup>

<b>Nail Plate</b>	
Indication	Pigment deposit, onychomycosis, metabolic-hereditary dystrophies
Type	Punch biopsy Distal incision
<b>Nail Bed</b>	
Indication	Onychomycosis, psoriasis, Bowen disease, glomal tumor, osteochondroma, melanoma
Type	Punch biopsy Excisional/incisional elliptical biopsy with nail avulsion
<b>Nail Matrix</b>	
Indication	Psoriasis, lichen planus, ephelides and lentigo, melanoma, tumors
Type	Punch biopsy Excisional/incisional elliptical biopsy Lateral longitudinal biopsy
<b>Entire Nail Unit</b>	
Indication	Longitudinal melanonychia, psoriasis, lichen planus, pigment cell tumors, ingrown toenail
Type	Lateral longitudinal biopsy

<sup>a</sup>Indications according to the preferential site of histologic expression of the nail diseases

they account for approximately 10% of all dermatological complaints<sup>1</sup> and may be the cause of considerable discomfort for the patient from both a clinical and esthetic perspective. Although these diseases are usually easily detected, the fact that they are highly varied and, at the same time, clinically very similar means that it is occasionally not possible to obtain an accurate diagnosis without the use of surgical diagnostic techniques such as nail biopsy.<sup>2</sup> This technique is a useful diagnostic method for differentiating physiologic nail processes from pathological processes and avoiding delayed diagnosis of important processes thereby occasionally saving the life of the patient. It also has therapeutic value.<sup>3</sup>

Few studies have evaluated the utility of nail biopsy as a diagnostic technique. The main objective of this study is to assess the diagnostic capacity of nail biopsy in patients with nail disorders in which clinical and additional tests were unable to provide a diagnosis.

## Patients and Methods

We identified 15 patients in the dermatology department of the Virgen de la Victoria University Hospital, Malaga,

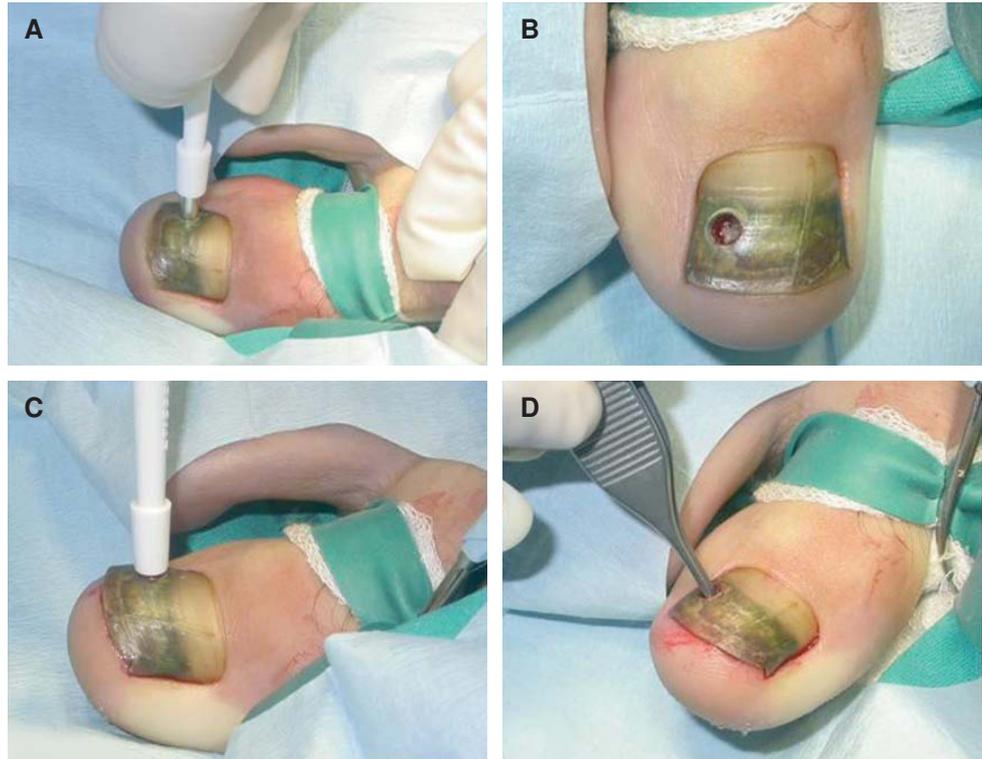
Spain, between June 2005 and May 2006, who presented with a nail disorder and underwent a nail biopsy.

All the patients had previously received a provisional clinical diagnosis based on a detailed clinical history that included information such as duration of the lesions, number of nails affected, profession, medication, family history, habits, and personal hygiene. Patients also underwent a complete examination of the skin, mucosa, and nail. In each case, a portion of the affected nail was required; it was then compared with the contralateral finger and images were taken of all cases. Cultures for fungi had been previously requested in cases of suspected onychomycosis; results were negative. Patients were informed of the surgical procedure, the chances of success or failure, and the risk of sequelae; they were then required to sign an informed consent form.

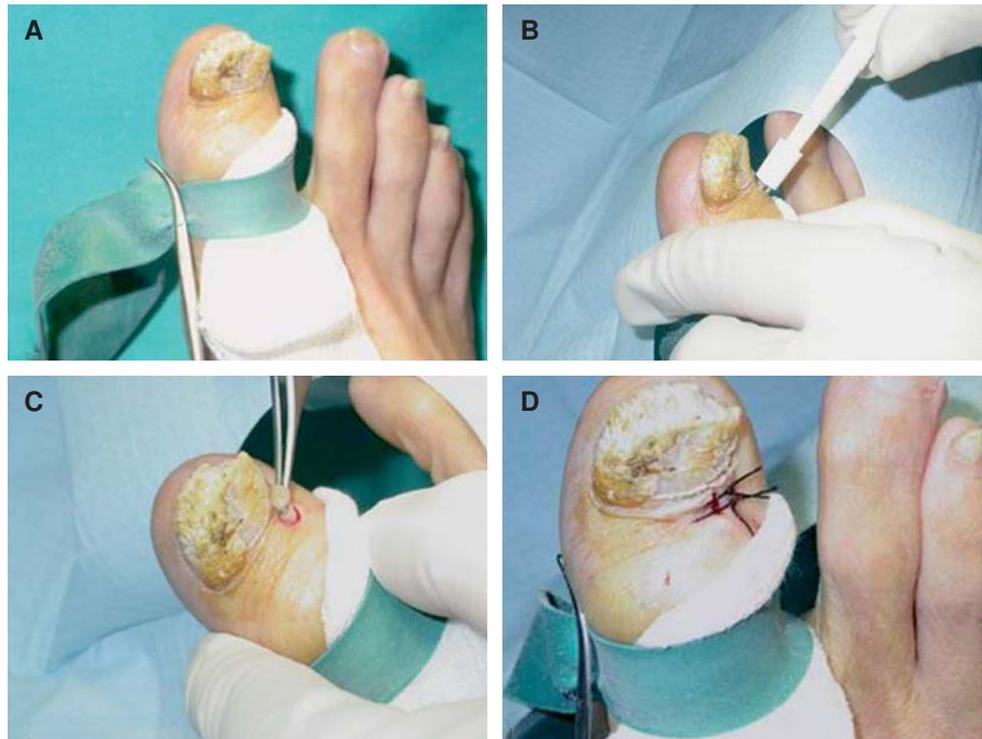
Anesthesia was performed by means of digital block, periungual block, or a combination of both, using 2% mepivacaine. Adequate ischemia was achieved using a digital tourniquet placed at the base of the finger for a maximum of 15 minutes. The type of biopsy performed in each case was dependent on the provisional clinical diagnosis and the area affected, in accordance with recommendations of previous authors<sup>3</sup> (Table 1).

The following 4 different biopsy techniques were used:

1. Nail plate biopsy. This consists of cutting a fragment measuring at least 3 cm from the distal portion of the nail plate, together with the adhering subungual keratosis. If the nail is short, it may be necessary to use a punch biopsy to obtain a small disc of nail plate from an area other than the free margin.
2. Nail bed biopsy. After avulsion of the nail plate, a fusiform excision is made measuring no more than 3 mm in width. This type of biopsy may also be performed through the nail plate using the double punch technique, which involves a punch biopsy of the nail plate measuring 4 or 6 mm, followed by a 3-mm punch biopsy of the nail bed, taken through the window created in the nail plate (Figure 1). The resulting wound is sutured, though if it measures 3 mm or less it may granulate by second-intention healing.
3. Matrix biopsy. A flap of the proximal nail fold is resected to expose the matrix and a transversal fusiform or crescent-shaped biopsy of the matrix is then performed, taking care not to biopsy the most proximal area; the wound is then sutured. A punch biopsy may also be performed using a 3-mm punch down to the bone (Figure 2). In this case, the wound does not require suturing.
4. Lateral longitudinal biopsy. This involves a longitudinal resection including the matrix, nail folds, nail bed, and hyponychium. A fusiform incision is begun in the most



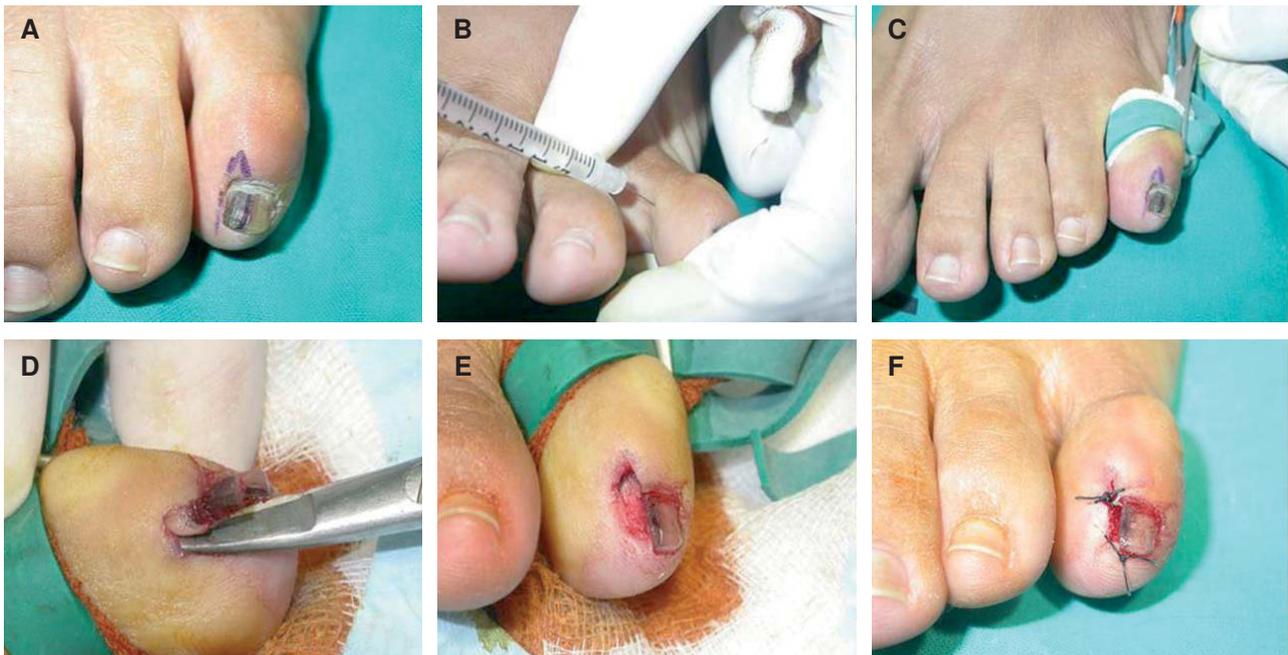
**Figure 1.** Nail punch biopsy using double punch technique. A and B) Biopsy using a 4-mm punch of the nail plate. C and D) Biopsy using a 3-mm punch of the nail bed through the window created in the nail.



**Figure 2.** Nail matrix biopsy using a 3-mm punch on the proximal nail fold.

distal fold of the distal interphalangeal joint, moving laterally through the lateral nail fold and medially through the plate, to reach the hyponychium. The

tissue is then dissected en bloc and freed from the bone. The lateral nail fold is sutured to the nail bed (Figure 3).



**Figure 3.** Lateral longitudinal biopsy in a case of longitudinal melanonychia.

In our study, the type of biopsy was chosen according to suspected clinical diagnosis as follows: a) onychomycosis, nail plate biopsy and/or nail bed biopsy; b) psoriasis, nail bed biopsy and/or nail matrix biopsy; c) to rule out lichen planus, nail matrix biopsy; and d) pigmented lesions, nail matrix biopsy or lateral longitudinal biopsy if the entire nail unit was affected.

The samples obtained were processed using standard hematoxylin–eosin techniques; other specific stains such as periodic acid–Schiff (PAS), methenamine silver, S-100, and HMB-45 were used in some cases due to the suspected clinical diagnosis.

## Results

Of the 15 patients included in the study, 9 were women and 6 were men; ages ranged between 27 and 69 years. Table 2 shows the clinical and histopathologic characteristics of each case. None of the patients presented concomitant dermatosis.

Histopathology tests provided an accurate diagnosis of the nail disorder in 13 cases. In 4 cases, the histopathology study of both the nail plate and nail bed revealed fungal structures, diagnosed as onychomycosis (Figure 4). A diagnosis of psoriasis was established in 5 cases (Figure 5): following study of the nail bed in 2 cases and following a matrix biopsy in the other cases. The diagnosis of melanoma was confirmed in 1 case when the biopsy of the nail bed

revealed a proliferation of neoplastic melanocytes grouped in irregular bundles in the papillar and reticular dermis (Figure 6). One patient was diagnosed with subungual hematoma. The 2 patients who underwent a lateral longitudinal biopsy were diagnosed with longitudinal melanonychia (Figure 7) and a tumor was ruled out. The biopsy was nonspecific in 2 cases.

After a 12-month follow-up period, all the patients in our study showed normal growth of the biopsied nail and no residual scarring or other side effects were observed.

## Discussion

Nail biopsy is a technique that is rarely used in routine clinical practice, partly due to the difficulty in performing it and the risk of residual scarring. An increasing number of authors, however, consider that it is a useful and safe technique if correctly performed<sup>3-5</sup> and that it facilitates diagnosis of potentially dangerous cases or cases that can lead to nail deformities.

It is not a difficult technique to perform, but it does require a thorough knowledge of the anatomy and physiology of the nail, as well as surgical experience and the cooperation of the patient. The decision to perform a nail biopsy and the type of biopsy to be used depend on the disease and the clinically effected area of the nail; the type of biopsy to be performed is indicated by the structure in which the principal abnormalities are present.<sup>6</sup> Nail biopsy should

**Table 2** Clinical and Histologic Data in Patients with Nail Disorders

Case	Suspected Clinical Diagnosis	Type of Biopsy	Histopathological Diagnosis
1	Psoriasis	NMB	Psoriasis
2	Onychomycosis	NPB	Onychomycosis
3	Psoriasis or lichen planus	NMB	Psoriasis
4	Subungual tumor	NBB	Melanoma
5	Onychomycosis	NBB	Nonspecific
6	Lichen planus	NMB	Psoriasis
7	Hematoma or melanonychia	NPB + NBB	Subungual hematoma
8	Onychomycosis or psoriasis	NPB + NBB	Onychomycosis
9	Onychomycosis or psoriasis	NBB	Psoriasis
10	Onychomycosis	NBB	Psoriasis
11	Onychomycosis	NBB	Onychomycosis
12	Subungual pigment	LNB	Longitudinal melanonychia
13	Onychomycosis	NPB + NBB	Onychomycosis
14	Subungual pigment	LNB	Longitudinal melanonychia
15	Psoriasis	NBB	Nonspecific

Abbreviations: LNB, longitudinal nail biopsy; NBB, nail bed biopsy; NMB, nail matrix biopsy; NPB, nail plate biopsy.

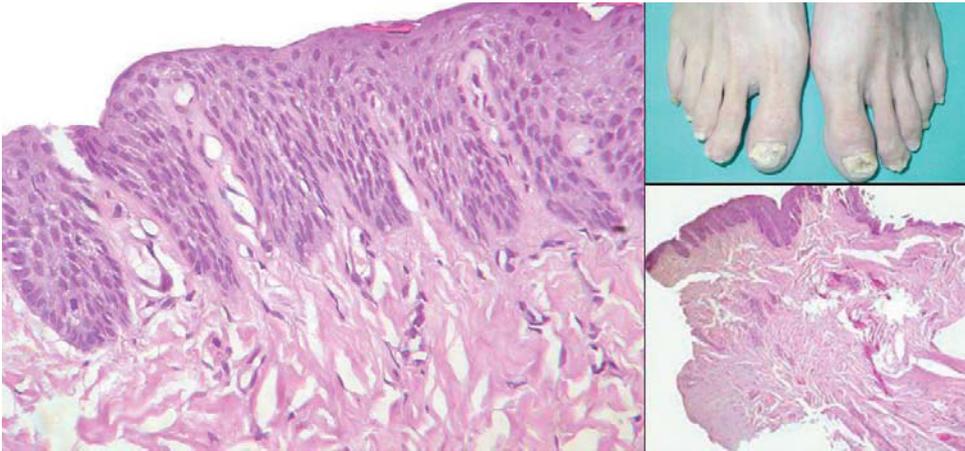
**Figure 4.** Onychomycosis. Fungal structures stained with methenamine silver (hematoxylin–eosin,  $\times 4$ ; methenamine silver,  $\times 40$ ).



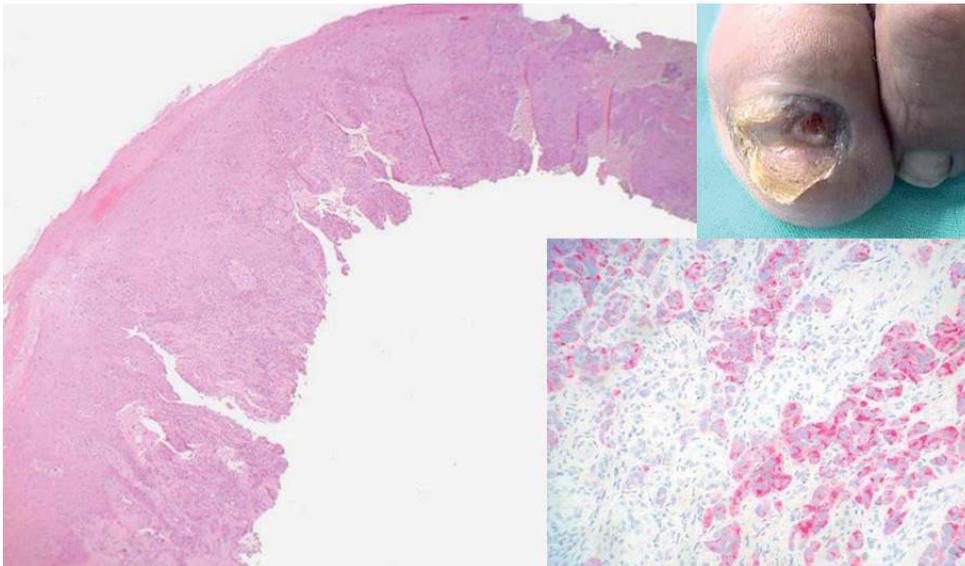
therefore be performed on a patient-by-patient basis and the most appropriate site for the biopsy should be chosen in each case; this will essentially depend on the clinically suspected disease being expressed histologically.

The general indications for this technique include diagnosis or ruling out of infectious processes such as onychomycosis when microbiology studies are negative. In our study, as in those of other authors,<sup>7</sup> nail biopsy made it possible to show the presence of microorganisms in the keratinized cells of the nail bed and in the lower part of the nail plate in patients for whom cultures were

repeatedly negative. Furthermore, the clinical manifestation of subungual onychomycosis can be indistinguishable from other skin diseases such as psoriasis. In these cases, nail biopsy is a useful technique for performing a differential diagnosis because, although the histopathology of both diseases presents very similar changes, a negative PAS stain for fungi is considered to confirm a diagnosis of nail psoriasis.<sup>8</sup> Several of our patients were diagnosed with psoriasis when the biopsy was negative for fungal structures, despite a clinical diagnosis of suspected onychomycosis.



**Figure 5.** Nail psoriasis. Histology shows acanthotic papillomatosis with focal hyperkeratosis, flattening of the suprapapillary plate, and dilation of the vessels in dermal papillae (hematoxylin–eosin,  $\times 4$ ,  $\times 20$ ).



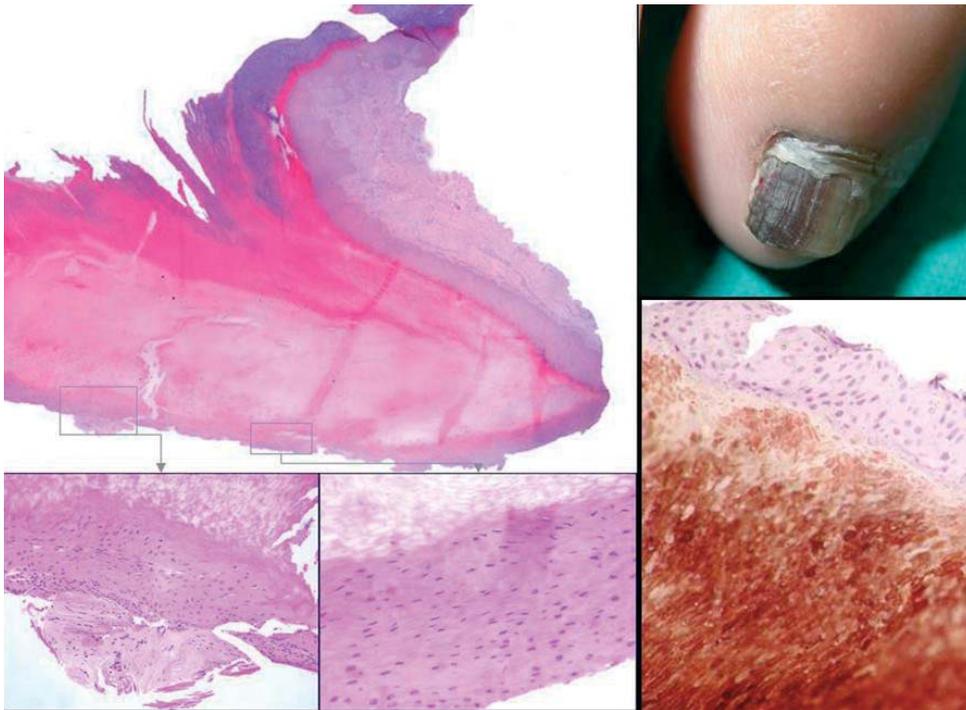
**Figure 6.** Melanoma. Irregular bundles and strings of melanocytes stained with HMB-45 (hematoxylin–eosin,  $\times 10$ ).

Nail biopsy is considered to be a useful technique for distinguishing subungual hemorrhage from melanin pigmentation and for diagnosing or ruling out melanoma, especially in cases where no clear diagnosis is obtained using other noninvasive methods, such as dermatoscopy. In our study, nail biopsy confirmed the clinical diagnosis of subungual melanoma in 1 case. In such cases, the support of the dermatologic diagnosis is required as a prior step to surgical treatment, which must involve the amputation of the toe or finger with the affected nail. One of the limitations we have found with the technique, however, is the interpretation of cases of longitudinal melanonychia as these cases occasionally present histologic characteristics that make them very difficult to distinguish from subungual melanoma. Hence, different types of lesion in the nail matrix potentially responsible for the presence of longitudinal

pigmented bands have been described, including epidermal hyperpigmentation (melanocyte activation), lentigo simplex (due to melanocytic hyperplasia), melanocytic nevus of the matrix, or melanoma.<sup>7</sup> In the 2 cases in our study that presented longitudinal melanonychia, it was not possible to define the exact type of lesion, though neoplasm was ruled out.

In conclusion, our experience shows that nail biopsy can be considered as a useful tool in nail abnormalities where patient history, clinical appearance, and mycology tests do not provide an exact diagnosis. We consider that this technique should be a part of routine practice for dermatologists, as it is no more complicated than any other routine surgical procedure.

Nevertheless, controlled studies with a larger number of patients and a wider range of nail diseases are required in



**Figure 7.** Longitudinal melanonychia. Pigment deposit in the stratum corneum with increased number and size of melanocytes in the basement membrane of the nail matrix (hematoxylin–eosin,  $\times 4$ ,  $\times 20$ ,  $\times 40$ ; melanin,  $\times 40$ ).

order to provide a more conclusive statistical assessment of the utility of this technique.

#### Conflicts of Interest

The authors declare no conflicts of interest.

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