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NAIL BIOPSY TECHNIQUES IN THE DIAGNOSIS OF NAIL UNIT DISORDERS: A NARRATIVE LITERATURE REVIEW

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ABSTRACT
The nail unit is far more than a cosmetic feature, as it plays vital roles in protecting the fingertip, facilitating fine motor tasks, and serving as a window to overall systemic health. While nail disorders can stem from localized issues, they often signal underlying disease processes. When typical nail conditions such as onychomycosis, longitudinal melanonychia, psoriasis, or lichen planus fail to improve with standard treatment, or when there is concern about malignancy, histological examination becomes necessary. However, nail biopsy and surgical intervention remain surprisingly uncommon in everyday dermatology practice, largely because clinicians worry about the technical demands of the procedure and its potential to cause lasting nail damage. To provide a comprehensive review of nail biopsy techniques, covering anatomical considerations, clinical indications, pre-procedural preparation, anesthetic methods, and the selection of appropriate biopsy techniques based on the site and nature of nail pathology. A narrative literature review was conducted by systematically examining, reviewing, and synthesizing published studies, textbooks, and clinical guidelines pertaining to nail unit anatomy, nail disorders requiring histopathological confirmation, and surgical biopsy techniques. The identified literature was critically appraised to extract relevant data, compare findings across sources, and synthesize the available evidence to provide a comprehensive understanding of the indications, diagnostic considerations, and surgical approaches to nail unit biopsy. Sources were identified through relevant dermatology and dermatosurgery literature published between 2016 and 2026. Nail biopsy may be performed on the nail matrix, nail bed, or nail plate using punch, excision, shave, or longitudinal techniques. Indications include chronic paronychia, nail psoriasis, longitudinal melanonychia, subungual hematoma, nail lichen planus, and both benign and malignant nail neoplasms, such as glomus tumour, squamous cell carcinoma, and subungual melanoma. Adequate anaesthesia, achieved via proximal digital block, wing block, digital collateral nerve block, or transthecal digital anaesthesia, is fundamental to procedural success. Technique selection must balance the need for an adequate specimen against the risk of permanent dystrophy, with longitudinal biopsy offering the most comprehensive evaluation of the nail apparatus. Nail biopsy is an indispensable diagnostic and therapeutic procedure in the management of nail disorders. A thorough understanding of nail unit anatomy, careful patient selection, appropriate anaesthetic technique, and judicious choice of biopsy method are essential to obtain a diagnostically adequate specimen while minimising the risk of permanent nail damage.

Keywords: digital block anaesthesia; longitudinal biopsy; nail biopsy; nail matrix; nail neoplasm; nail unit

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INTRODUCTION

The nail unit is a specialized skin appendage with important protective, mechanical, sensory, and aesthetic functions. Disorders affecting the nail unit may significantly impair function and quality of life. Accurate diagnosis requires comprehensive clinical evaluation, and in selected cases, additional investigations such as dermoscopy, imaging, mycological examination, and histopathological assessment are necessary. Although often considered cosmetic problems, nail abnormalities may represent underlying inflammatory, infectious, or neoplastic diseases requiring further evaluation

(Lee & Lipner, 2022). Nail biopsy is an important diagnostic procedure, particularly when clinical findings are uncertain or malignancy must be excluded. It is indicated in various conditions, including persistent onychomycosis-like lesions, longitudinal melanonychia, nail psoriasis, nail lichen planus, and suspected nail melanoma. In addition to its diagnostic role, nail biopsy may also provide therapeutic benefits in selected nail unit tumors, such as glomus tumors (Levin & Vatanchi, 2024; Grover & Bansal, 2018). Several biopsy techniques have been described, including punch biopsy, excisional biopsy, shave biopsy, and longitudinal biopsy. The selection of biopsy technique should balance the need for adequate tissue sampling with the risk of permanent nail deformity. Therefore, understanding nail anatomy, histology, and appropriate biopsy techniques is essential to achieve accurate diagnosis while minimizing complications (Queirós et al., 2022; Levin & Vatanchi, 2024). This manuscript aims to review the indications, techniques, and clinical considerations of nail biopsy as an essential diagnostic approach for nail unit disorders.

METHOD

This study was conducted using a narrative literature review approach to summarize and synthesize current evidence regarding nail biopsy techniques and their clinical applications in the diagnosis of nail unit disorders. Literature searches were performed using several electronic databases, including PubMed, Google Scholar, Elsevier, and ResearchGate. The literature search was conducted for publications published between 2016 and 2026. The search strategy used combinations of keywords related to the topic, including “nail biopsy,” “nail biopsy techniques,” “nail anesthesia techniques,” “nail disorders,” and “nail malignancy.” Relevant articles were identified based on their alignment with the objectives of this review, particularly studies discussing the indications, procedural techniques, anatomical considerations, anesthesia methods, histopathological evaluation, and clinical management related to nail biopsy.

Selected literature consisted of original research articles, review articles, clinical studies, and relevant reference materials. Articles were assessed based on their relevance, scientific quality, and contribution to understanding nail biopsy procedures. The extracted information was then analyzed descriptively and synthesized into major themes, including indications for biopsy, anatomical considerations of the nail unit, biopsy techniques, anesthesia approaches, specimen handling, and postoperative care. This narrative synthesis aimed to provide a comprehensive overview of current approaches to nail biopsy and highlight the importance of appropriate technique selection in achieving accurate diagnosis while minimizing complications associated with nail unit procedures.

RESULT

The narrative literature review identified nail biopsy as an essential diagnostic procedure in the comprehensive management of nail unit disorders. A systematic examination of published studies from 2016 to 2026 revealed extensive evidence supporting the clinical application of nail biopsy techniques in dermatological practice.



Figure 1. Nail psoriasis, melanonychia, and nail lichen planus requiring histopathological examination for diagnostic confirmation (Van Paris, 2025; Moulonguet et al., 2026; Singal et al., 2023)



Figure 2. Clinical features of nail unit squamous cell carcinoma presenting with lateral onycholysis and invasive nail apparatus melanoma. (Starace et al., 2018; Ito et al., 2023)



Figure 3. Lateral longitudinal nail biopsy using a proximally curved S-shaped incision designed to preserve the lateral nail matrix. Following closure, the excision wound edges showed good approximation. (Kantor, 2018)



Figure 4. Tangential excision technique for a pigmented nail matrix lesion, performed with careful removal of the lesion while preserving the underlying nail matrix structures. (Hill et al., 2024)



Figure 5. Punch biopsy technique performed on the distal nail matrix for histopathological evaluation. (Nouri et al., 2019)



Figure 6. Proximal digital nerve block technique. Local anesthetic solution is injected at the base of the digit bilaterally to achieve digital nerve blockade and provide adequate anesthesia for the nail surgical field. (Grover & Bansal, 2018)



Figure 7. Wing block anesthesia technique for nail surgery, involving local anesthetic injection around the lateral aspects of the digit to achieve targeted digital nerve blockade. (Weinberg et al., 2017)

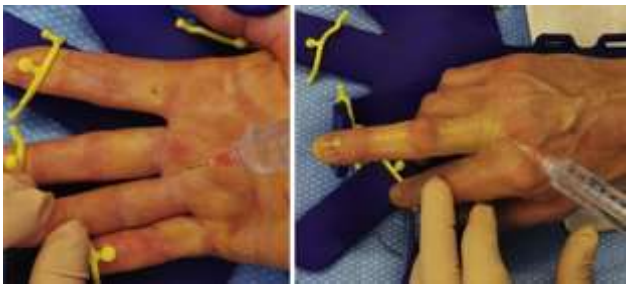


Figure 8. Digital collateral nerve block technique. Local anesthetic is injected into both palmar neurovascular bundles and administered through a dorsal approach to provide adequate anesthesia of the entire digit. (Facca, 2024)



Figure 9. Needle insertion technique with the needle positioned perpendicular to the skin surface at a point just proximal to the distal palmar crease of the digit. (Smythe et al., 2024)

DISCUSSION

The literature review identified nail biopsy as an important diagnostic procedure in the evaluation of various nail unit disorders, particularly in cases where clinical examination and non-invasive investigations are insufficient to establish a definitive diagnosis. The nail unit consists of multiple anatomical structures, including the nail matrix, nail bed, nail plate, proximal and lateral nail folds, and surrounding periungual tissues, which may each contribute to different pathological manifestations. Therefore, accurate identification of the affected structure is essential in determining the appropriate biopsy approach and obtaining representative tissue samples (Lee & Lipner, 2022; Queirós et al., 2022).

The reviewed studies demonstrated that nail biopsy is primarily indicated for persistent, atypical, or diagnostically challenging nail disorders. Common clinical indications include chronic paronychia unresponsive to conventional therapy, isolated nail psoriasis, nail lichen planus, longitudinal melanonychia, suspected nail unit melanoma, and various benign or malignant nail tumors. Although many nail disorders are initially considered cosmetic problems, several conditions may represent early manifestations of serious underlying diseases, including malignancy. Therefore, histopathological examination through nail biopsy remains an important diagnostic tool when clinical uncertainty persists (Lee & Lipner, 2022; Levin & Vatanchi, 2024).

Chronic paronychia represents one of the conditions requiring consideration for biopsy, particularly when the condition persists despite appropriate management or occurs as an isolated lesion affecting a single nail. In such cases, an underlying neoplastic process, including nail unit squamous cell carcinoma, should be excluded. Similarly, nail psoriasis may occasionally require histopathological confirmation when clinical features are atypical or overlap with other inflammatory nail disorders such as onychomycosis or lichen planus (Löser et al., 2021; Van Paris, 2025). Pigmented nail lesions, particularly longitudinal melanonychia, represent one of the most important indications for nail biopsy because of the possibility of nail unit melanoma. The literature emphasizes that distinguishing benign melanocytic proliferation from malignant melanoma based solely on clinical appearance can be challenging. Features such as progressive enlargement of pigmentation, irregular borders, color variation, triangular pigmentation patterns, involvement of a single digit, and changes occurring in adulthood should raise suspicion and prompt further evaluation with biopsy (Das De et al., 2022).

Histopathological examination remains the gold standard for diagnosing melanocytic lesions of the nail unit. Appropriate biopsy selection is critical because inadequate sampling may result in missed diagnosis or inaccurate interpretation. In particular, biopsy of the nail matrix is essential because melanocytic activity responsible for longitudinal pigmentation frequently originates from this anatomical region. Therefore, selection of the biopsy technique should consider lesion location, width, pigmentation pattern, and the suspected origin of the lesion (Ríos-Viñuela et al., 2021). Nail SCC may present with nonspecific clinical findings, including chronic paronychia, hyperkeratosis, nail plate destruction, erythema, ulceration, longitudinal erythronychia, or melanonychia. Due to these variable presentations, nail SCC is frequently misdiagnosed as benign inflammatory or infectious nail disease, leading to delayed diagnosis. Histopathological confirmation through biopsy is therefore essential in suspicious lesions to establish early diagnosis and appropriate management (Barone et al., 2022; Chang et al., 2024; Venturi et al., 2025).

The choice of technique depends on the anatomical location of the lesion, clinical indication, required diagnostic information, and the potential risk of permanent nail deformity. Since the nail matrix is responsible for nail plate formation, inappropriate intervention in this area may result in irreversible nail dystrophy. Therefore, biopsy procedures require careful planning based on detailed knowledge of nail anatomy (Grover & Bansal, 2018; Queirós et al., 2022). Longitudinal nail biopsy provides a comprehensive specimen that includes multiple components of the nail apparatus, including the nail matrix, nail bed, nail plate, and surrounding soft tissue. This technique is particularly useful when the exact origin of the lesion is uncertain or when evaluation of multiple nail structures is required. However, because longitudinal biopsy involves a relatively extensive surgical approach, it carries a higher risk of postoperative nail deformity if performed incorrectly (Grover & Bansal, 2018).

Matrix excision biopsy is commonly performed for localized lesions arising from the nail matrix, including suspicious pigmented lesions. This technique allows direct evaluation of the area responsible for nail plate formation and is particularly useful in cases requiring exclusion of melanoma. However, excessive removal of matrix tissue may lead to permanent nail abnormalities, making precise surgical technique essential (Ríos-Viñuela et al., 2021). Tangential shave biopsy has emerged as a useful approach for selected nail matrix lesions, particularly broad pigmented lesions. This technique involves superficial removal of the lesion parallel to the nail matrix surface, aiming to obtain diagnostic tissue while preserving deeper matrix structures. The main advantage of this method is reduced risk of permanent nail dystrophy compared with deeper excisional procedures. Nevertheless, incomplete removal or inadequate depth may contribute to recurrence or insufficient histopathological evaluation (Bertanha et al., 2024). Punch biopsy represents a minimally invasive technique suitable for small and localized lesions involving the nail matrix or nail bed. A 3-mm

punch biopsy is commonly recommended because it provides sufficient tissue while limiting structural damage. Larger punch sizes may increase the risk of permanent nail deformity, particularly when performed on the proximal nail matrix, where even small injuries can significantly affect nail growth (Levin & Vatanchi, 2024; Nouri et al., 2019).

Adequate anesthesia is a fundamental component of successful nail biopsy procedures because the nail unit contains dense sensory innervation and highly sensitive structures. The selection of anesthesia technique depends on the location and extent of the procedure, as well as the expected duration of surgical manipulation (Weinberg et al., 2017). Proximal digital nerve block remains one of the most commonly used techniques for nail surgery because it provides reliable anesthesia of the entire distal digit. However, it requires injection at a relatively proximal site and may involve multiple injections. Alternative techniques, such as wing block, may provide targeted anesthesia for procedures involving the distal nail apparatus, while reducing discomfort associated with injection volume (Weinberg et al., 2017). Recent studies have also discussed transthecal and subcutaneous digital block techniques as alternatives for digital anesthesia. These methods may provide effective anesthesia through fewer injection sites, faster onset, and improved patient comfort. Appropriate knowledge of digital neurovascular anatomy is essential to maximize anesthetic effectiveness and minimize complications (Facca, 2024; Smythe et al., 2024).

Postoperative management was identified as an important factor influencing patient comfort and recovery following nail biopsy. The literature emphasizes the importance of controlling pain, preventing excessive bleeding, and protecting the surgical site during the healing period. Long-acting local anesthetics, such as bupivacaine or ropivacaine, may provide extended postoperative analgesia. Additional strategies include elevation of the affected digit, ice application, protective dressing, and appropriate analgesic administration (Glass et al., 2015; Lipner, 2018). Pain management strategies commonly involve acetaminophen and non-steroidal anti-inflammatory drugs (NSAIDs), which have demonstrated effectiveness in reducing postoperative discomfort. Persistent severe pain beyond the expected postoperative period should prompt evaluation for possible complications, including infection, ischemia, or excessive tissue injury (Glass et al., 2015; Lipner, 2018).

Proper specimen handling is another critical determinant of diagnostic accuracy. Nail biopsy specimens require careful orientation and preservation to maintain anatomical relationships between different nail structures. The use of tissue-marking dye, placement of specimens between foam pads in tissue cassettes, and fixation using 10% neutral buffered formalin help preserve tissue architecture during histopathological processing. These procedures facilitate accurate interpretation, particularly in complex lesions involving the nail matrix and nail bed (Doolan et al., 2019).

CONCLUSION

Nail biopsy is an essential diagnostic procedure for evaluating a wide range of nail unit disorders, including inflammatory diseases, pigmented lesions, benign tumors, and malignant neoplasms. The procedure provides valuable histopathological information, particularly in cases where clinical and non-invasive examinations are insufficient to establish a definitive diagnosis. Early recognition of suspicious nail changes and appropriate biopsy indication are crucial to prevent delayed diagnosis, especially in potentially malignant conditions such as nail unit melanoma and squamous cell carcinoma. The success of nail biopsy depends on a comprehensive understanding of nail unit anatomy, appropriate selection of anesthesia techniques, and careful choice of biopsy methods according to lesion characteristics and anatomical location. Longitudinal biopsy, matrix excision biopsy, tangential shave biopsy, and punch biopsy each have specific advantages and limitations that must be considered to obtain adequate diagnostic specimens while minimizing the risk of permanent nail deformity. Proper perioperative management, including effective pain control,

protection of the surgical site, and appropriate specimen handling, plays an important role in optimizing patient outcomes and improving histopathological accuracy. Therefore, nail biopsy should be performed using a structured approach that integrates anatomical knowledge, surgical technique, and pathological evaluation. A well-planned biopsy procedure can improve diagnostic accuracy, reduce procedural complications, and support appropriate management of patients with complex nail unit disorders.

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REFERENCES

Barone, H., Schaeffer, M., Buckland, M., LaFond, A. A., & Krach, K. (2022). Squamous cell carcinoma in situ of the nail unit: Current evidence and recommendations for patient-centered treatment. Journal of Cutaneous Medicine and Surgery, 27(1), 51–59.

Bertanha, L., Damas, I. I., Stelini, R. F., Cintra, M. L., & Di Chiacchio, N. (2024). Role of tangential biopsy in the diagnosis of nail psoriasis. Anais Brasileiros de Dermatologia, 99(5), 696–705. https://doi.org/10.1016/j.abd.2023.11.005

Chang, M. J., Schwartz Kahn, M., & Khachemoune, A. (2024). Squamous cell carcinoma of the nail in patients with Fitzpatrick phototypes: A systematic review. International Journal of Dermatology, 63(10), 1302–1307.

Das De, S., Tan, K. B., Ho, S. A. J. E., Athanasian, E. A., & Puhaindran, M. E. (2022). Pigmented nail lesions: When to observe, when to biopsy, when to widely excise, and when to amputate? Journal of Hand Surgery, 47(10), 988–997. https://doi.org/10.1016/j.jhsa.2022.06.029

Doolan, B. J., Prakash, S., Tan, C. G., & Kern, J. S. (2019). The use of cassettes for the collection of nail biopsy specimens. Australasian Journal of Dermatology, 60(3), 248–250. https://doi.org/10.1111/ajd.13078

Facca, S. (2024). Techniques of nail anesthesia. Hand Surgery & Rehabilitation, 43, 101659. https://doi.org/10.1016/j.hansur.2024.101659

Glass, J. S., Hardy, C. L., Meeks, N. M., & Carroll, B. T. (2015). Acute pain management in dermatology. Journal of the American Academy of Dermatology, 73(4), 543–560.

Grover, C., & Bansal, S. (2018). Nail biopsy: A user's manual. Indian Dermatology Online Journal, 9(1), 3–15. https://doi.org/10.4103/idoj.IDOJ_436_17

Hill, R., Katsiaunis, A., & Lipner, S. (2024). Nailing the nail biopsy: Surgical instruments and their function in nail biopsy procedures. Cutis, 114(4), 130.

Ito, T., Hashimoto, H., Kaku-Ito, Y., Tanaka, Y., & Nakahara, T. (2023). Nail apparatus melanoma: Current management and future perspectives. Journal of Clinical Medicine, 12(6), 2203. https://doi.org/10.3390/jcm12062203

Kantor, J. (2018). Nail procedure. In Dermatologic surgery (Vol. 18, pp. 251–259). McGraw-Hill Education.

Lee, D. K., & Lipner, S. R. (2022). Optimal diagnosis and management of common nail disorders. Annals of Medicine, 54(1), 694–712. https://doi.org/10.1080/07853890.2022.2044511

Levin, A., & Vatanchi, M. (2024). Nail biopsy. In StatPearls. StatPearls Publishing.

Lipner, S. R. (2018). Pain-minimizing strategies for nail surgery. Cutis, 101(2), 76–77.

Löser, C. R., Nenoff, P., Mainusch, O., Dippel, E., & Balakirski, G. (2021). Common diseases of the nail: Diagnosis and therapy. Journal der Deutschen Dermatologischen Gesellschaft, 19(12), 1761–1775. https://doi.org/10.1111/ddg.14627

Moulonguet, I., Caucanas, M., & Goettmann, S. (2026). Longitudinal melanonychia in children: Clinical and histopathologic features and management with literature update. Dermatopathology, 13(1), 13. https://doi.org/10.3390/dermatopathology13010013

Nouri, K., Benjamin, L., Alshaiji, J., & Izakovic, J. (2019). Pediatric dermatologic surgery. John Wiley & Sons.

Queirós, C., Garrido, P., Fraga, A., Maia-Silva, J., & Filipe, P. (2022). Nail surgery: General principles, fundamental techniques, and practical applications. Journal of Cutaneous and Aesthetic Surgery, 15(4), 341–351.

Ríos-Viñuela, E., Nájera-Botello, L., Requena, L., Nagore, E., & Requena, C. (2021). Subungual melanocytic lesions: Key clinical and pathologic concepts and biopsy techniques. Actas Dermo-Sifiliográficas (English Edition), 112(7), 573–585.

Singal, A., Gaurav, V., & Kaur, I. (2023). Clinical characteristics and management outcomes in isolated nail lichen planus: A retrospective case series. Indian Journal of Dermatology, Venereology and Leprology, 90, 329–335. https://doi.org/10.25259/IJDVL_449_2023

Smythe, C., Lauck, K. C., & Tolkachjov, S. N. (2024). Reexamining digital anesthesia: The transthecal/subcutaneous digital block. Archives of Dermatological Research, 316(8).

Starace, M., Alessandrini, A., Dika, E., & Piraccini, B. M. (2018). Squamous cell carcinoma of the nail unit. Dermatology Practical & Conceptual, 8(3), 238–244. https://doi.org/10.5826/dpc.0803a17

Van Paris, F. (2025). Nail psoriasis: A narrative review of manifestations, diagnosis, and management. EMJ Dermatology, 2(1), 60–65.

Venturi, F., Magnaterra, E., Scotti, B., Alessandrini, A., Veneziano, L., Vaccari, S., et al. (2025). Squamous cell carcinoma of the nail unit: A comprehensive review of clinical features, diagnostic workflow, management strategies and therapeutic options. Diagnostics, 15(18), 2378.

Weinberg, T., Solish, M., & Murray, C. (2017). Digital anaesthesia and relevant digital anatomy for the dermatologist. Journal of Cutaneous Medicine and Surgery, 21(5), 467–471. https://doi.org/10.1177/1203475417711125.