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Case Report

Modified Howard–Dubois Procedure Combined with Low-Level Laser Therapy for Nail and Distal Toe Hypertrophy: A Case Report with Three-Year Follow-Up

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Abstract

Background: Distal nail embedding (DNE) is a rare variant of onychocryptosis characterised by obstruction of distal nail growth by hypertrophic soft tissue, with or without underlying osseous prominence. It can lead to pain, nail deformity, and functional limitation.

Case Presentation: A 29-year-old female presented with chronic DNE of the right hallux associated with nail dystrophy, recurrent onycholysis, and onychomycosis, resulting in significant functional impairment. Conservative and antifungal treatments had failed.

Intervention: A modified Howard–Dubois procedure, including distal soft tissue resection, dorsal distal phalanx contouring, and nail avulsion, was performed under local anaesthesia. Following wound healing, low-level laser therapy (LLLT) was used to support nail regeneration.

Results: At three-year follow-up, sustained restoration of nail morphology and hallux contour was observed, with no recurrence of distal embedding or hypertrophy. The nail demonstrated normal adherence and appearance, with excellent functional and cosmetic outcomes.

Conclusion: This case highlights the potential role of combining a modified Howard–Dubois procedure with adjunctive LLLT in achieving long-term correction and nail regeneration in complex DNE.

Keywords: *Distal Nail Embedding; Modified Howard Dubois; Hyponychium hypertrophy; Distal phalanx contouring; Low-level laser therapy; Nail regeneration; Nail dystrophy.*

Introduction

Distal nail embedding (DNE) is a variant of onychocryptosis characterised by obstruction of the distal nail plate by hypertrophic soft tissue at the toe tip, often resulting in pain, nail deformity, and functional limitation.[1] The condition is multifactorial in origin, with recognised contributing factors including trauma, previous nail procedures, and abnormal mechanical loading of the hallux.[2] In some cases, underlying osseous abnormalities, such as dorsal prominence of the distal phalanx, may further contribute to persistent nail impingement and soft tissue hypertrophy.[3]

Initial management is typically conservative and aimed at reducing mechanical pressure and facilitating normal nail growth. Approaches such as nail reduction, keratolytic agents, and footwear modification may provide symptomatic relief; however, recurrence and incomplete resolution are common, particularly in chronic or structurally driven cases.[4]

Surgical intervention may therefore be indicated in recalcitrant presentations. Techniques such as the Vandenbos procedure and the Howard–Dubois procedure aim to address the underlying soft tissue pathology through excision of hypertrophic periungual or distal tissues.[5 6] However, outcomes may be influenced by uncorrected structural abnormalities, particularly when osseous contributions to distal nail embedding are present.

The modified Howard–Dubois procedure incorporating contouring of the distal phalanx have been proposed to address both soft tissue and osseous components of the condition, thereby restoring the anatomical relationship between the nail plate and surrounding structures.[5] In parallel, low-level laser therapy (LLLT) has been explored as an adjunctive modality to promote tissue healing and support nail regeneration, although evidence in this specific context remains limited.[7 8]

This report describes a case of chronic, treatment-resistant DNE managed with a modified Howard–Dubois procedure incorporating distal phalanx contouring, followed by adjunctive LLLT, with sustained clinical and cosmetic outcomes at three-year follow-up.

Case Presentation

A 29-year-old female presented with a one-year history of progressive pain and deformity affecting the right hallux. Symptoms were localised to the distal aspect of the toe and were associated with distal nail embedding and significant nail plate dystrophy.

The patient was otherwise fit and well, with no relevant past medical history, regular medications, or known allergies. She reported recurrent episodes of onycholysis, including previous complete loss of the hallux nail plate.

An immunochromatographic assay confirmed the presence of a dermatophyte infection. However, persistence of nail deformity despite prior antifungal treatment suggested an underlying structural component contributing to the condition.

The patient reported significant pain at the distal toe tip, which affected daily activities, including walking and exercise. As a recreational runner, she described a marked reduction in activity levels and associated decline in quality of life. Previous conservative management had failed to provide sustained improvement, and the patient expressed a preference for definitive surgical intervention.

Clinical examination demonstrated marked hypertrophy of the distal toe tip and hyponychium, with associated distortion of the nail plate. The prominence of distal soft tissue and clinical appearance of the toe tip raised suspicion of an underlying structural contribution to the deformity. In the absence of imaging, the diagnosis was made on clinical grounds, and surgical intervention was planned to address both soft tissue hypertrophy and potential osseous involvement.

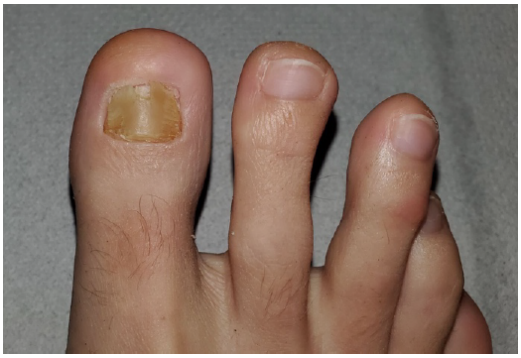

Figure 1. *Clinical photograph of the toe prior to surgery.*

Intervention

The patient was counselled on both conservative and surgical management options and elected to undergo a modified Howard–Dubois procedure. Informed consent was obtained prior to surgery.

Preoperative vascular assessment confirmed adequate perfusion, with biphasic dorsalis pedis and posterior tibial signals on Doppler examination. The surgical site was prepared using standard antiseptic protocol.

A digital block was performed using 3 mL of 3% mepivacaine, and a digital tourniquet was applied to achieve haemostasis.

An elliptical incision (~12 mm) was made at the distal aspect of the hallux. Hypertrophic soft tissue of the hyponychium was excised, exposing the distal phalanx. The dorsal aspect of the distal phalanx was contoured using a surgical saw to reduce distal prominence and restore anatomical alignment.

The dystrophic nail plate was fully avulsed. The wound was irrigated and closed primarily with simple interrupted non-absorbable sutures, and a sterile dressing was applied. Postoperative instructions included elevation, wound care, and monitoring for complications. Follow-up was arranged to assess healing and nail regrowth.

Following complete epithelialisation of the surgical site, adjunctive low-level laser therapy (LLLT) was initiated to support nail regeneration. Treatment was delivered using the Erchonia Lunula Laser system over 12 sessions. The protocol consisted of four weekly treatments followed by a three-week interval, which was then repeated. Each treatment session lasted 12 minutes and utilised dual-wavelength, non-thermal laser technology (405 nm and 635 nm), consistent with the manufacturer's treatment protocol for nail restoration and photobiomodulation. The patient tolerated the therapy well, with no reported adverse effects.

Results

Early Postoperative Period (9 Days)

At 9 days postoperatively, reduction in hyponychial hypertrophy was observed, with improved alignment of the distal nail bed. The surgical site remained well approximated, with no clinical signs of infection.

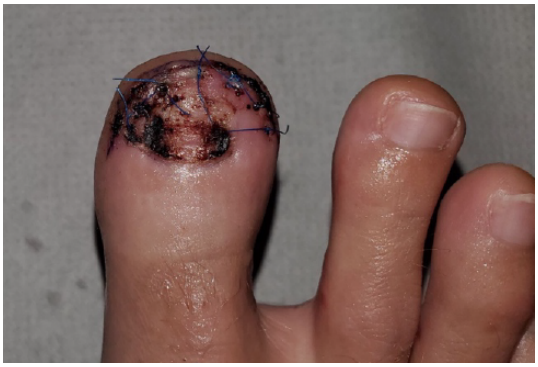

Figure 2. *Clinical photograph post-procedure.*

3 Weeks Postoperative

At 3 weeks, the wound had healed satisfactorily with no evidence of infection or dehiscence. Sutures were removed at 2 weeks, and the patient had resumed normal daily activities with minimal discomfort.

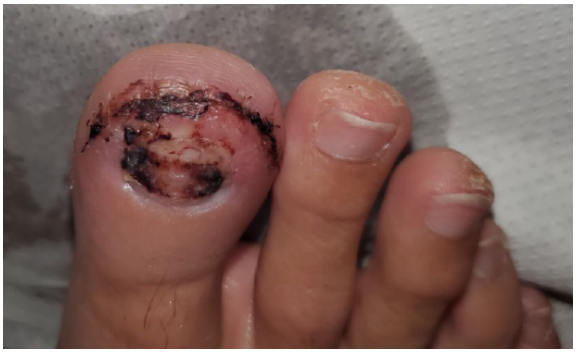

Figure 3. *Clinical photograph at three weeks post procedure.*

5 Weeks Postoperative

By 5 weeks, complete epithelialisation was achieved. The distal hallux demonstrated a smooth contour with no residual hypertrophy. The patient reported no pain and was satisfied with the cosmetic outcome.

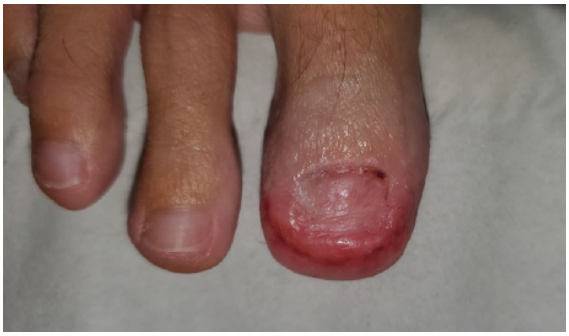

Figure 4.*Clinical photograph at five weeks post procedure.*

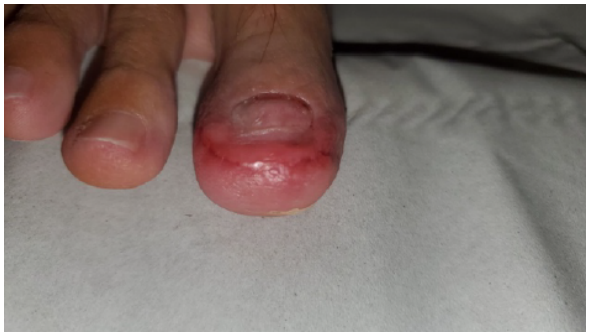

Figure 4.1. *Clinical photograph at five weeks post procedure.*

3 Months Postoperative

At 12 weeks, early nail plate regrowth was observed. The emerging nail appeared wider and clearer compared to the preoperative nail. The distal soft tissue correction remained stable, with maintained reduction in hyponychial bulk.

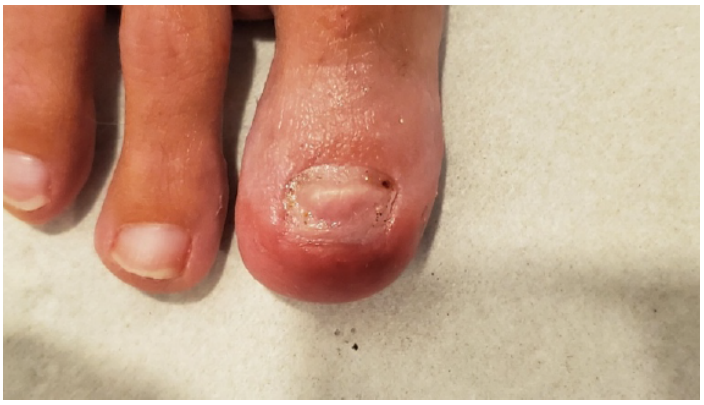

Figure 5. *Clinical photograph at twelve weeks post procedure.*

9+ Months Postoperative

Substantial nail regrowth was evident, with progressive improvement in nail plate clarity and surface regularity. There was no recurrence of distal embedding or soft tissue hypertrophy. The surgical site remained well healed.

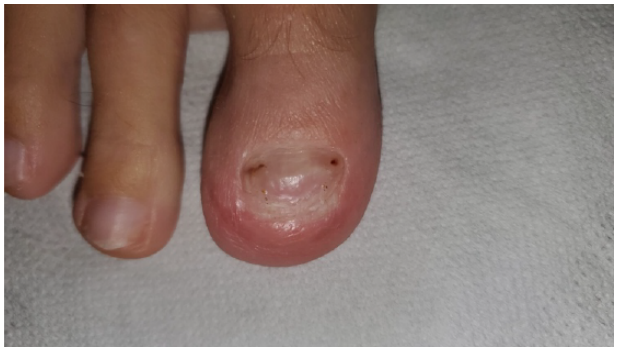

Figure 6. *Clinical photograph at nine months post procedure.*

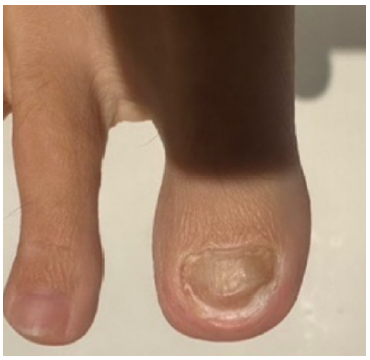

Figure 6.1. *Clinical photograph – June 2024.*

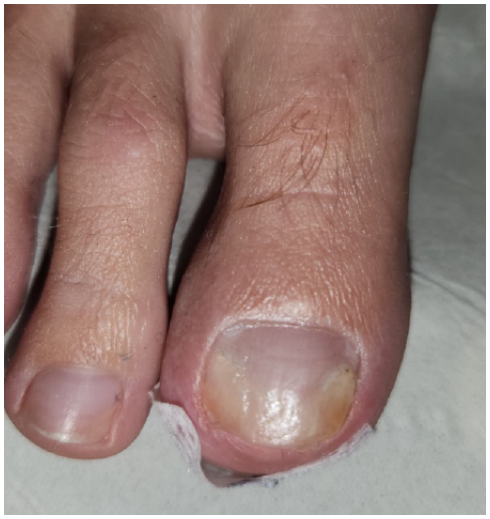

Figure 6.2. *Clinical photograph – November 2025.*

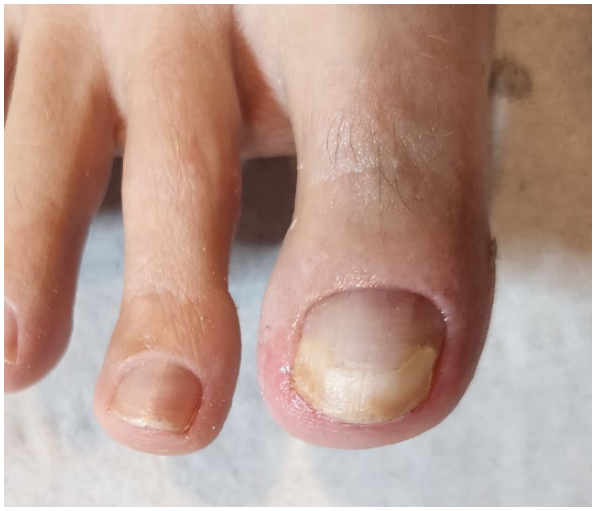

Figure 6.3. *Clinical photograph – December 2025.*

3-Year Follow-Up

At 3 years, the nail plate demonstrated normal morphology, including appropriate thickness, translucency, and adherence. There was no evidence of onycholysis, recurrence, or periungual pathology.

Cosmetic comparison with the contralateral hallux showed a symmetrical and satisfactory appearance. The patient remained asymptomatic, with no functional limitations or need for further intervention.

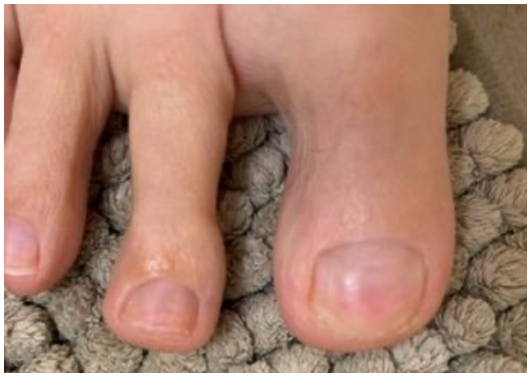

Figure 7. *Clinical photograph at three-year follow-up.*

Discussion

The successful outcome in this case reflects the importance of addressing both structural and biological contributors to DNE. While surgical correction formed the primary intervention, adjunctive measures including low-level laser therapy (LLLT) was incorporated to optimise the periungual environment and support long-term recovery. The sustained improvement observed over three years suggests that a combined approach targeting both anatomical deformity and external mechanical factors may be required for durable results.

The modified Howard–Dubois procedure was selected due to the presence of significant distal soft tissue hypertrophy and nail plate distortion. Unlike matricectomy procedures, which primarily target the nail matrix, the Howard–Dubois technique addresses hypertrophic periungual tissues that can mechanically impede normal nail growth.[5] In this case, excision of hypertrophic tissue alone was unlikely to be sufficient, given the clinical suspicion of underlying structural involvement.

Dorsal prominence of the distal phalanx has been described as a contributing factor in distal nail embedding, as it may elevate the distal soft tissues and disrupt the normal trajectory of nail growth.[3] The modification employed in this case(contouring of the distal phalanx in addition to soft tissue resection) was therefore intended to restore a more physiological relationship between the nail plate and surrounding structures. Previous studies have reported favourable outcomes using similar combined approaches, with low recurrence rates and high patient satisfaction.

The outcome in this case is consistent with these findings, with complete resolution of soft tissue hypertrophy, restoration of normal nail growth, and no evidence of recurrence at three-year follow-up. This supports the rationale for addressing both soft tissue and osseous components in selected patients, particularly where deformity of the distal toe contributes to the pathology.

Adjunctive LLLT was introduced following wound healing to support nail regeneration. While its independent effect cannot be determined within a single case, progressive improvement in nail quality and morphology was observed over time. These findings are consistent with the proposed role of photobiomodulation in promoting tissue repair and cellular activity.[8]

This case highlights the need to consider DNE as a condition involving the entire nail unit and distal toe anatomy, rather than the nail plate alone. In patients presenting with significant soft tissue hypertrophy or suspected structural involvement, treatment strategies limited to the nail matrix may be insufficient. A combined approach addressing soft tissue, underlying bony prominence, and external mechanical factors may provide more reliable long-term outcomes. Adjunctive therapies such as low-level laser therapy may support nail regeneration, although further research is required to establish their independent contribution.

Conclusion

This case demonstrates successful long-term management of chronic distal nail embedding using a modified Howard–Dubois procedure incorporating distal phalanx contouring. The intervention resulted in sustained correction of nail morphology and hallux contour, with no recurrence at three-year follow-up. Adjunctive low-level laser therapy was associated with progressive improvement in nail quality; however, its independent contribution remains uncertain. This case supports a multimodal surgical approach in selected patients with complex distal nail deformities involving both soft tissue and osseous components.

Informed Consent

Informed written consent was obtained from the patient for publication of clinical information and photographic images.

Conflict of Interest

The authors declare no conflicts of interest.

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