

# Reconceptualization of Proximal Nail Fold Reconstruction: Skin Grafting over the Nail Plate

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**Summary:** The structure of the periungual area is complicated, resulting in historically difficult morphological reconstruction after trauma or cancer resection. There is also no established standard for its reconstruction; thus, we aimed to use a full-thickness skin graft (FTSG) over the nail plate. Three patients with Bowen disease on their proximal nail fold (PNF) underwent excision with a 2-mm margin preserving the nail matrix, and a temporary wound dressing was applied. The FTSG was harvested from the ipsilateral ulnar wrist joint and placed over the skin defect, including the nail plate. Initially, the FTSG seemed to have shrunk; however, after 3 months, it extended and the PNF had a good color and texture match. Remarkably, the FTSG adhered to the nail plate, and the complex PNF structure appeared well reconstructed. Occasionally, a local flap is used; however, it is limited to small defects and causes a deformity of the periungual structure. In this study, the reconstructed PNF showed good results. We presumed that the bridging phenomenon caused graft survival on the nail plate, and that the presence of stem cells near the nail matrix caused graft extension and eponychium and cuticle regeneration. Specifically, the acquisition of sufficient raw surface around the nail plate and wound preparation after excision resulted in the former, and the nail matrix preservation after excision contributed to the latter. This surgical technique is simple and can therefore be considered a remarkably effective method for periungual area reconstruction to date. (*Plast Reconstr Surg Glob Open* 2023; 11:e5047; doi: [10.1097/GOX.0000000000005047](https://doi.org/10.1097/GOX.0000000000005047); Published online 13 June 2023.)

## INTRODUCTION

The structure of the periungual area is complicated, resulting in difficult morphological reconstruction after trauma or cancer resection. However, the preservation of the nail apparatus is important because its destruction is conspicuous, and patients experience psychological difficulty accepting a deformity.<sup>1</sup>

In cancer treatment, surgical resection is generally recommended,<sup>2</sup> but due to the complex structure of the periungual area, alternative treatments, such as topical and photodynamic therapy, are preferred. Therefore, we aimed to reconceptualize the periungual area reconstruction with a simple skin graft over the nail plate after cancer resection.

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Received for publication February 15, 2023; accepted April 11, 2023.

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DOI: [10.1097/GOX.0000000000005047](https://doi.org/10.1097/GOX.0000000000005047)

## CASES

Between 2018 and 2022, we encountered three patients with Bowen disease in their nail units. Bowen disease is characterized by intraepidermal lesions associated with squamous cell carcinoma. Its causes include human papillomavirus infection, exposure to ultraviolet light, radiation therapy, and wound scarring.<sup>2</sup> We treated the periungual Bowen disease with excision and full-thickness skin grafting (FTSG) over the nail plate.

Patient 1 was a 40-year-old man who presented with a light-brown skin lesion measuring 8×11 mm on the proximal nail fold (PNF) of the right middle finger. Patient 2 was a 44-year-old man who presented with an erythematous skin lesion measuring 10×11 mm on the PNF of the left index finger. Patient 3 was a 36-year-old man who presented with an erythematous skin lesion measuring 7×12 mm on the PNF of the right index finger.

All patients underwent biopsies and were diagnosed with Bowen disease. No nail plate deformity or discoloration was observed ([Fig. 1](#)). This study was conducted after the Declaration of Helsinki, and was approved by the ethics board of our institution. Written informed consent was obtained from all patients before study participation.

Disclosure statements are at the end of this article, following the correspondence information.



**Fig. 1.** Photograph at the first consultation (patient 1).

### METHODS

In all patients, the excision line was determined with a 2-mm margin, and the PNF was resected from all layers, preserving the nail matrix (Fig. 2). After excision, wound dressing was applied for approximately 1 week until the pathological diagnosis was determined. All patients were histopathologically diagnosed with Bowen disease and negative margins. An FTSG was harvested from the ipsilateral ulnar wrist joint and placed over the skin defect that included the nail plate with a tie-over dressing (Fig. 3).

### RESULTS

In the second postoperative week, the skin graft seemed to have shrunken. However, in the third postoperative month, it had extended, and the PNF had a healthy appearance in terms of both color and texture match. Moreover, the eponychium and cuticle regenerated. No recurrence occurred at 6 months postoperatively (Fig. 4). All patients were satisfied with the results.

### DISCUSSION

Periungual defects can result in significant functional impairment and cosmetic disfigurement<sup>3</sup>; therefore, reconstructions after injury and cancer resection are important. However, the structure of the periungual area

### Takeaways

**Question:** How can we find the best method to reconstruct the historically difficult to reconstruct proximal nail fold?

**Findings:** We transplanted the full-thickness skin graft over the nail plate from the ipsilateral ulnar wrist joint, resulting in a good appearance of the proximal nail fold, including the eponychium, which compared favorably with the preoperative appearance.

**Meaning:** Skin graft over the nail plate is a simple and effective method to reconstruct the proximal nail fold.



**Fig. 2.** A 2-mm margin is made, including the PNF with all layers, after excising the lesion.

is complicated, and the best method for reconstruction is not yet established. Particularly, the PNF has a unique structure, with a crescent-shaped sheet of tissues covered by the dermis on its dorsal and undersurface.<sup>4</sup>

For periungual cancer treatment, excision and reconstruction using a local flap have been reported.<sup>5</sup> However, this technique is used only in patients with sufficiently small defects because of the lack of abundant adjacent tissues.<sup>6</sup>

Alternative nonsurgical treatments, such as photodynamic therapy and topical treatments, have been reported<sup>2</sup>; however, these treatments should be continuous and require special equipment, and their efficacy remains unclear. After an extensive search for the ideal



**Fig. 3.** Transplantation of the FTSG over the nail plate from the ipsilateral ulnar wrist joint.



**Fig. 4.** After excision and reconstruction. The PNF, including the eponychium, is suitably reconstructed.

cancer excision and reconstruction method, reconstruction via skin grafting was performed.

We reconstructed the PNF using an FTSG over the nail plate, and the outcome appearance, including that of the eponychium and cuticle, was acceptable. The reconstruction method is simple, and the technique is easy to perform as the graft harvest is in the same surgical field. Moreover, there were no deformities in the nail apparatus, and the harvest scar was inconspicuous. Thus, unprecedented results were achieved due to this novel reconstruction method.

Remarkably, the FTSG transplanted onto the nail plate survived and extended, despite the temporary shrinkage. We hypothesized that this skin graft would survive in the avascular field with good reconstructive results.

The bridging phenomenon is presumably related to skin graft survival over the nail plate. Gingrass et al recommended the use of FTSG over split-thickness skin grafts in the avascular field, with grafts of 3 mm or more beyond the avascular field margins and wound beds prepared for several days, which is associated with graft survival based on the bridging phenomenon.<sup>7</sup> For all three patients, an FTSG was used, and a 2-mm margin excision was performed to obtain a sufficient vascular field around the nail plate. Moreover, an ideal wound bed preparation was achieved with approximately 1 week of

application of a wound dressing. We believe that these factors contributed to skin graft survival over the nail plate.

We also hypothesized that the presence of stem cells associated with peri-nail epidermis neogenesis was related to the skin graft extension. We performed the excision while preserving the nail matrix, with vicinity stem cells that are thought to exist<sup>8,9</sup>; thus, the shrunken skin graft could extend and produce the desired morphological appearance. Moreover, the presence of stem cells could result in eponychium and cuticle regeneration.

This study has some limitations. First, the sample size was small (three patients). Second, the location of the lesion was limited to the PNF in all patients. Other periungual lesions, such as those that extend into the lateral nail fold, should also be considered. However, as mentioned above, if the bridging phenomenon occurs, the lateral nail fold reconstruction may be possible by the same means because a sufficient vascular field can be secured around the nail plate.

Finally, a biopsy specimen was not obtained on the reconstructed PNF; thus, we could not confirm whether the reconstructed PNF was histologically normal. Further studies are needed to establish a periungual reconstruction using an FTSG, as mentioned. These patients should be followed up, and any recurrence treated.

## CONCLUSION

FTSG over the nail plate is a simple and effective method for PNF reconstruction.

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## DISCLOSURE

*The authors have no financial interest to declare in relation to the content for this article.*

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