



Preservative and surgical interventions to treat ingrown nail and pincer nail

Akira Kasuya MD, PhD | Yoshiki Tokura MD, PhD

Department of Dermatology, Hamamatsu University School of Medicine, Hamamatsu, Japan

Correspondence

Akira Kasuya, Department of Dermatology, Hamamatsu University School of Medicine, Higashi-Ku, Hamamatsu, Japan.
Email: casuakijo1@gmail.com

Abstract

Ingrown nail and pincer nail are common diseases. Although they are sometimes indistinguishable and described together, they are different conditions. Pincer nail is a situation where nail plate is curved transversely. On the other hand, ingrown nail represents a condition, where lateral edge of nail cuts deep into the lateral nail fold causing severe inflammation and even pyogenic granuloma. Ingrown nail and pincer nail coexist in some patients. In certain occupational environments, these nail diseases frequently occur as well as irritant and allergic skin diseases. In addition, they may take place in patients receiving epidermal growth factor receptor inhibitors. Different approaches should be made for the treatment of these nail conditions. Historically, surgical interventions, as exemplified by partial avulsion of nail plate and matricectomy, were usually selected. Currently, a number of preservative methods have been emerging, including nail sculpture, Tsume Flat[®], Pedigrass[®], VHO[®], and hyperelastic wire. However, there has been no golden standard. Each facility takes its own method for the treatment. In this review, we explain these preservative methods as well as surgical interventions.

KEYWORDS

ingrown nail, pincer nail, preservative method

1 | INTRODUCTION

Ingrown nail and pincer nail are highly frequent nail problems (Table 1). They are distinct conditions and need different approaches for the treatment. Ingrown nail and pincer nail coexist in some patients. In certain occupational environments, these nail diseases frequently occur as well as irritant and allergic skin diseases.¹⁻³ In addition, they may take place in patients receiving epidermal growth factor receptor inhibitors.² There are a considerable number of interventions, including preservative and operative methods. However, there has been no golden standard.

Here, in this review, we first define the ingrown nail and pincer nail. We then mention the conservative and operative methods on

each of ingrown nail and pincer nail. All of procedures are approved by Ethical Committee in Hamamatsu University School of Medicine (IRB:17-285).

2 | DEFINITION AND MECHANISM OF INGROWN NAIL AND Pincer NAIL

Pincer nail and ingrown nail are different disorders by definition. Pincer nail is a condition where the nail plate is curved transversely. The lateral edge of nail may irritate the lateral nail fold and cause some pain (Figure 1). Inappropriate loading of weight is thought to cause pincer nail. A force from the downward usually works to flatten nail

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TABLE 1 Summary of treatment for ingrown nail and pincer nail

	Ingrown nail	Pincer nail
Surgical interventions		
Partial avulsion and matricectomy (chemical or surgical)	○	△
Anticonvex sutures of nail plate	Not applicable	○
Conservative interventions		
Cotton	△	△
Taping	△	△
Gutter method	○	△
Nail sculpture	○	△
Braces (VHO brace, Tsume flat, Pedigrass, etc.)	Not applicable	○
Correction devices using hot water (Makizume robo, Tsume flat, etc.)	Not applicable	○

○, Effective, △, Limitedly effective, ×, Insufficiently effective.

**FIGURE 1** Ingrown nail and pincer nail

plate, and lack of such a force causes pincer nail. Sano et al⁴ have reported that in both the barefoot and the shod state, the patient group of pincer nail had significantly lower pressure on the first toe than the control group. Loss of pressure could contribute to the development of pincer nail. Pincer nail takes place more frequently in elder people who have less occasion to walk. Attention should be paid, because pincer nail is sometimes complicated with *tinea unguium*.

On the other hand, ingrown nail is a condition, where the lateral edge of nail is cut deep into the lateral nail fold causing severe inflammation and even pyogenic granuloma. Therefore, pincer nail can progress into ingrown nail. Yet, ingrown nail can happen de novo. Inappropriate nail cutting, certain trauma, and improper selection of shoes cause ingrown nail. Some drugs, such as etretinate and epidermal growth factor inhibitors, can also cause severe ingrown nail as a side effect.² The mechanism underlying the formation of ingrown nail is expected as follows. Since the lateral edge of nail is always in contact with lateral nail fold, this part is always vulnerable to the shear stress. When the nail becomes wet with shoes, the nail becomes bristle and a part of nail might be teared. The resultant cut into lateral nail, like a splinter, may cause severe inflammation.

3 | TREATMENT OF COEXISTING MILD INGROWN NAIL AND Pincer NAIL

3.1 | Taping method

With adhesive bandage, the nailfold is pulled away from the nail.^{5,6} The idea of this technique is that it reduces the pressure of the nail on the edge of the nail. Tsunoda et al instructed 541 patients or their guardians in the use of the taping technique. Ingrown toenail symptoms and abnormal nail growth were resolved, and no additional therapy was required in 276 patients.⁶

3.2 | Cotton

Gutierrez-Mendoza reported the use of cotton in the nonsevere patients.⁷ A piece of cotton is placed between nail and nailfold to ease the incursion of nail into the nail fold. All patients noticed good results in <72 hours. Pain subsided in less than 24 hours in half of the patients and before 72 hours in 100% of the patients without the need of other treatments. The use of the cast prevented surgery and the accompanying morbidities in most of the patients (80%). They concluded that the cotton nail cast is an effective conservative method for mild nail embedding.

4 | TREATMENT FOR INGROWN NAIL

4.1 | Operation

For the treatment of ingrown nail, in our facility, we first remove pyogenic granuloma by radio knife under local anesthesia.⁸ We then resect the splinter of nail formed on the lateral edge of nail. Next, the lateral part of nail is partially removed with a width of 1-2 mm.^{5,9} Subsequently, chemical abrasion of partial nail matrix by phenol is performed to avoid the recurrence. Inappropriate ablation of nail matrix occasionally induces its recurrence. Alternatively, surgical matricectomy can be a choice.

Romero-Perez compared phenol matricectomy with surgical matricectomy.¹⁰ Ingrown toenail surgery was carried out in 520 patients.

FIGURE 2 Nail sculpture. In this case, pincer nail is first treated with Makizume Robo, as we mentioned in Figure 4. Nail sculpture is thus formed

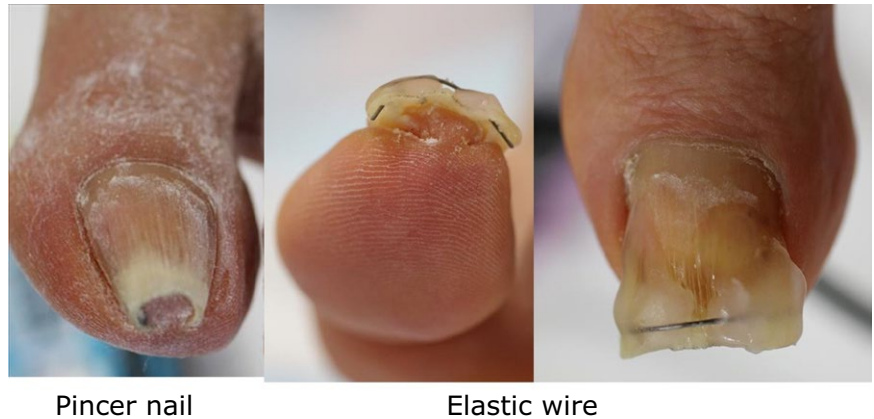
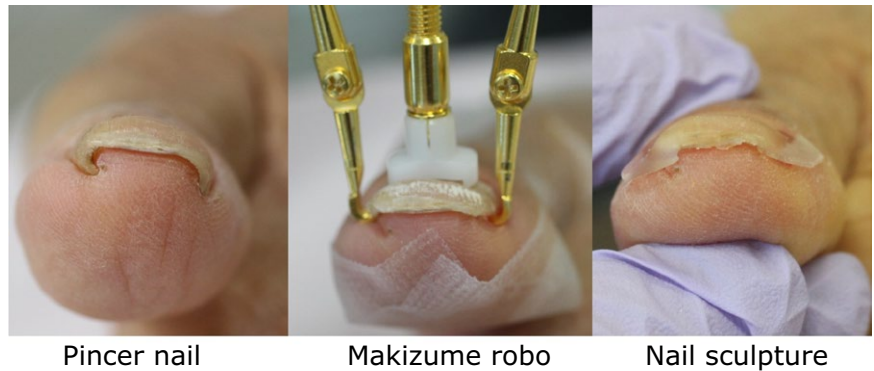


FIGURE 3 Hyperelastic wire

Surgical matrixectomy was associated with a lower recurrence rate (8.2%) than chemical matrixectomy with phenol (17.8%), more pain (5.7/10 vs 3.6/10), a higher risk of infection (15.3% vs 2.9%), and lower cosmetic satisfaction (7.3/10 vs 8.0/10). Overall satisfaction was similar in both procedures (8.5/10 and 8.4/10, respectively). Some variants of this method are reported, as exemplified by partial nail avulsion combined with crescent excision of the nail fold.¹¹ In some cases, trichloroacetic acid (TCA) can be used for ablation as an alternative to phenol.¹²

4.2 | Preservative method

4.2.1 | Gutter method

With gutter treatment (also known as gutter removal or splint technique), a small vinyl or plastic tube slit from top to bottom with one end diagonally cut is placed over the ingrowing nail side, separating the nail from the nail wall and preventing its further growth into the skin. Use of aspiration tube is convenient. The tube can be affixed with a tape or with sutures.¹³⁻¹⁷

4.2.2 | Nail sculpture

In our hospital, we use nail sculpture using formable acryl.¹⁸ Formable acryl is applied to the lateral edge of the nail to avoid the edge of nail cut into the nail fold (Figure 2). This intervention is partially effective for pincer nail as well, because the formed acryl plate pushes down the nail fold working for correcting the deformity of nail plate.

5 | TREATMENT FOR PINCER NAIL

5.1 | Operation

Surgical method for pincer nail¹⁹⁻²² usually consists of avulsion and partial matrixectomy. However, it might be difficult to correct the deformity only with operation. Diken et al²³ reported that additional two anticonvex sutures with 1-0 polypropylene can be performed to ensure proper nail plate shape.

5.2 | Preservative method

5.2.1 | Brace and wire method

Some metal devices have recently been developed to correct the deformity of the nail plate.^{24,25} A small hyperelastic flexible metal plate or wire is attached to the edge of the nail with hooks, which are placed on edges of the nail under tension. Then, the hyperelastic brace works to relieve nail pressure on the soft tissue and to correct the nail bed deformity. When the hyperelastic wire is used, both ends of the wire are fixed by small two holes on the free edge of nail plate (Figure 3). This brace method can be combined with another method to soften the nail plate facilitating the correction of the deformity. Okada et al used thioglycolic acid to soften the nail plate in combination with the wire method. Favorable reduction was achieved in 66% of 106 patients within 1 day of the procedure, in 30% within 2-4 days, in 4% 5 days or more later.²⁶



Pincer nail

Makizume robo

FIGURE 4 Makizume Robo

Pincer nail

Tsume flat wound up

FIGURE 5 Tsume flat rotator

VHO brace treatment²⁷ was developed in Germany. Two hooked wires are introduced on the lateral edge of the nail. Both wires are connected with a loop of wire, and then, the loop is wound up to apply the force, rifting up the edge of the nail to correct the deformity of the nail.

Pain due to treatment was significantly lower in the brace group than in the surgical procedure group, and patients in the brace group could wear regular shoes again without appreciable pain much earlier than those in the surgical procedure group.

A splint made of resin (Pedigrass Corp, Osaka Japan) is also available. This elastic splint is attached to the nail plate to fix the deformity of nail plate. A favorable reduction was achieved in 66% of patients within 1 day of the procedure, in 30% within 2-4 days, and in 4% 5 days or more later.²⁸ The merit of this device is that the treated nail has natural appearance, because the device is transparent.

5.2.2 | Other mechanical corrections

Recently, new methods have been emerging to mechanically correct the curved nail. We use a device called Makizume robo[®] (Figure 4, Makizume robo, Shikahama Corp. Tokyo, Japan). First,

we remove the nail scrapings under the nail. We then dip a foot in the hot water to soften the nail. Twenty minutes later, we apply the Makizume robot on the nail, setting the hook end on the edge of the nail. Then, we wind down the center bar under ward. The edge of the nail is pulled up. The finger set with the device is dipped again in the hot water for another 20 minutes. When the nail is dried up by hand drier, the shape of corrected nail is almost fixed and does not go back again. After the nail is dried, the device is removed.

Another device is Tsume flat rotator[®] (Figure 5, Tsume Flat Inc, Imabari, Japan). This can be used as an alternative to Makizume Robot[®]. The device is set on the edge of nail and roll up the edge of nail to correct the curved nail. This technique can be used in combination with another method such as braces, Tsume flat block (Tsume Flat Inc, Imabari, Japan) or cotton or surgical method.

6 | CONCLUSION

Interventions for ingrown nail and those for pincer nail are different. For the treatment of ingrown nail, surgical intervention is highly effective. However, to correct the deformity of pincer nail, conservative methods, such as brace, nail sculpture, mechanical method, are recommended.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ORCID

Akira Kasuya  <http://orcid.org/0000-0002-2107-9091>

Yoshiki Tokura  <http://orcid.org/0000-0001-7452-6919>

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