

ORIGINAL ARTICLE

Comparative study between nail retraining with gauze bandaging and the nail remodeling with acrylics as a conservative treatment for stage I and IIa onychocryptosis

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Abstract

Objective: Onychocryptosis is one of the most prevalent onychopathies, being a frequent reason for consultation in podiatric clinical practice. Conservative treatments are the first therapeutic choice, with nail remodeling using clotrimazole gel emerging as an alternative, although its medium-term effectiveness is unknown. The objective of this study was therefore to compare the efficacy of the technique of nail retraining using gauze bandaging with that of nail remodeling for the conservative treatment of stage I and IIA onychocryptosis.

Methods: An analytical, randomized clinical trial study was performed following a longitudinal and prospective design. A sample was selected of 20 subjects presenting stage I and IIA onychocryptosis. Of these, 10 cases formed the group of nail retraining using gauze bandaging, and the other 10 the nail remodeling group. The presence of recurrence in a 3-month period was evaluated.

Results: Before the intervention, the patients in the retraining group presented pain of 6.7 ± 1.9 vs. 6.8 ± 1.6 in the remodeling group, with no significant difference between the two ($p = 0.900$). After the 3-month follow-up period, seven of the retraining group patients presented recurrence of onychocryptosis vs. only one in the remodeling group.

Conclusion: The technique of nail remodeling has a lower recurrence rate than that of nail retraining with gauze bandaging, with the pain, inflammation, and infection reported being less, and with greater patient satisfaction.

KEYWORDS

conservative treatment, gauze bandaging, nail remodeling, nail retraining, onychocryptosis

1 | INTRODUCTION

Onychocryptosis, also known as “ingrown nail,” was first defined in 1845 by Lewis Durlacher as “nail that grows into the interior of the

flesh” as a result of its excessive curvature, which causes pain and inflammation of the surrounding tissues. Nonetheless, this was not the most appropriate definition since other authors attribute the cause to hypertrophy of the lateral nail fold due to improper cutting of the

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nail plate.¹ In addition, various other factors have been observed, such as a pronated foot, deviation of the first metatarsal segment,² or the use of certain drugs such as oral retinoids^{3,4} among others.^{5,6} In stages I or IIa of the pathology, conservative treatments are effective at reducing painful processes,⁷ and are now the first therapeutic choice, depending on the diagnosis, severity of the condition, prognosis, and physical condition of the patient. More severe stages of the pathology, such as IIb, III, or IV, require surgical treatment for their definitive resolution,¹ that consists in the elimination of the affected nail plate and their germinal matrix.⁸

The purpose of conservative treatments is to retrain nail growth to prevent the new nail from injuring periungual tissue. These conservative treatments range from simply cutting off the affected portion of nail,⁹ the gradual separation of the nail plate with tape,¹⁰ dental floss,¹¹ cotton, or gauze,¹² application of plastic or metallic plates with molecular memory toward horizontality,¹³ to remodeling the nail plate with resins.¹⁴ Nonetheless, the effectiveness of these treatments is restricted since, at 2–3 months, there is around 8.2%–28% recurrence¹² depending on the expertise of the professional who applies it, and strict adherence to the treatment on the part of the patient is necessary due to the very many subsequent visits that are required. Recurrences of the deformity are frequent and require surgical treatment as a definitive solution.

A novel treatment has emerged in recent years with the use of a 1% clotrimazole gel. An acrylic prosthesis in the shape of the original nail plate is applied in order to preserve the lateral fold where the lesion appears. The advantages of this treatment over previous treatments are as follows: its ease of application in a single-phase format, no mixing is required, no handling of toxic components is involved (as instead is the case for some acrylics that are accompanied by cyanoacrylate), it is cheaper than plastic or metallic onychomyxoma, and no anesthesia is required (as would be the case with a tube or cannula). There have as yet been no studies to support its effectiveness. The present study is based on the hypothesis that the result of reconstruction with the gel nail will be better in terms of pain, the presence of inflammation or infection, patient satisfaction, and recurrence. Its objective was to evaluate the efficacy of clotrimazole gel treatment by comparing it with the standard conservative treatment of spiculectomy and gauze as control.

2 | MATERIAL AND METHODS

2.1 | Participants

The sample consisted of 20 patients (16 women and 4 men, mean age 24.8 ± 5.7 years) with onychocryptosis. The study was carried out at the University of Valencia and the Aquilesia Podiatric Centre. The patients participated voluntarily in the study, signing their informed consent. The study complied with the requirements of the Helsinki declaration, being approved by the Bioethics and Biosafety committee (ID: 198A//2020) and registered at [ClinicalTrials.gov](https://clinicaltrials.gov) with the number NCT05214586. The inclusion criterion for

participation in the study was as follows: (1) stage I or IIa onychocryptosis of the hallux according to the Mozena classification.¹⁵ The exclusion criteria were as follows: patients who (1) did not allow clinical follow-up of the evolution of the pathology, (2) presented deforming nail pathologies, or (3) had undergone surgery for onychocryptosis.

2.2 | Temporal period

Sample selection was carried out in February 2022 by consecutive inclusion of the patients who attended for consultation. A randomization process was carried out by order of visit, with the first 10 patients (mean age 24.8 ± 4.5) undergoing the nail retraining technique with gauze bandaging, and the following 10 (mean age 25.6 ± 6.8) the nail remodeling technique.

2.3 | Procedure

The clinical history was completed with the patients' clinical characteristics, noting their measurement of pain on a visual analogue scale (VAS) and whether inflammation was present in the affected margin. The affected portion of the nail was cut and debrided prior to initiating the therapeutic plan. The two types of treatment were as follows: (1) Nail retraining with gauze bandaging. This consisted of the application of a wick of gauze between the margin and the nail plate, in order to avoid direct contact of the nail with the lateral fold (Figure 1). (2) Application of a prosthesis made of an acrylic gel with 1% clotrimazole (BAHER) and that polymerizes under a UV lamp (9 W). This is applied onto the nail using a flat spatula, letting the gel spread over the entire nail plate up to the folds of the margins, exerting sufficient pressure on the prosthesis to maintain the spacing between the nail and the lateral fold in order to prevent recurrence of onychocryptosis (Figure 2).



FIGURE 1 Application of a gauze wick in the nail margin

FIGURE 2 Placement of gel on the nail plate, and UV curing



2.4 | Follow-up

The follow-up of the two groups of subjects was carried out in April and May 2022, 3 months after the first visit. The subjects were informed that they were not to cut their nails by themselves during the period. In the case of appearance of symptoms associated with onychocryptosis, the subjects had to contact the researcher as soon as possible. They would be given an appointment for consultation to proceed to a new spiculectomy and perform the conservative technique corresponding to their study group. In this follow-up, a new VAS measurement of the pain was made, as well as noting any inflammatory or infectious symptoms. Patient satisfaction with the treatment performed was assessed on a scale from 0 to 10.

2.5 | Statistical analysis

The variables were recurrence, inflammation, or infection after the intervention (Yes/No). A chi-squared test was used for the comparison of these variables. The quantitative variables were pain after the intervention and degree of patient satisfaction. First, the Shapiro–Wilk test was performed to determine the fit of the data to normality. The data did not present a normal distribution ($p = 0.023$), so that a Mann–Whitney U-test was performed. The pre- and post-intervention frequencies were compared using a chi-squared test. Statistical calculations were done using SPSS version 22.0 (UEX campus license). The significance level established was 5% ($p < 0.05$).

3 | RESULTS

In each of the two groups (retraining and remodeling), seven patients presented stage I onychocryptosis and three patients stage IIa. Inflammation of the nail fold was present in nine patients of the nail remodeling group and four of the nail retraining group, and inflammation was present in six patients of the nail retraining group as against one of the nail remodeling group. No case presented infection at the visit corresponding to initiation of the treatment (Table 1).

Before the intervention, the patients in the retraining group presented pain of 6.7 ± 1.9 compared with 6.8 ± 1.6 in the remodeling

TABLE 1 Stage, inflammation, and infection frequencies

	Retraining	Remodeling
Stage		
Stage I	7	7
Stage IIa	3	3
Inflammation		
Absent	4	9
Present	6	1
Infection		
Absent	10	10
Present	0	0

TABLE 2 Recurrence, inflammation, and infection frequencies after the application of retraining or remodeling

	Retraining	Remodeling	<i>p</i>
Recurrence			
Absent	3	9	0.006
Present	7	1	
Inflammation			
Absent	4	9	0.019
Present	6	1	
Infection			
Absent	10	10	1
Present	0	0	

Note: Chi-squared test.

group, with there being no significant difference between the two ($p = 0.900$). After the 3-month follow-up period, seven patients in the retraining group presented recurrence of onychocryptosis, while only one patient in the remodeling group presented recurrence, the difference between the two being statistically significant ($p = 0.006$, Table 2). The patients in the retraining group presented more inflammation than the remodeling group ($p = 0.019$, Table 2).

There was a greater degree of satisfaction in the remodeling group than in the retraining group (8.6 ± 1.2 vs. 4.7 ± 2.11 , $p < 0.001$). Pain in the remodeling group was significantly less than in the retraining group ($p = 0.001$, Table 3).

	Overall	Retraining	Remodeling	p
Degree of satisfaction	6.6 ± 2.6	4.7 ± 2.11	8.6 ± 1.2	<0.001
Post-intervention pain	3.2 ± 2.11	4.9 ± 1.8	1.5 ± 0.7	<0.001

Note: Mann-Whitney U-test.

TABLE 3 Results of the degree of satisfaction and pain (overall and by groups)

4 | DISCUSSION

The main objective of this work has been to analyze and compare the efficacy of two conservative techniques for the treatment of onychocryptosis in stages I and IIA according to the Mozena classification: nail retraining with gauze bandaging and nail remodeling.

Surgical techniques of ingrown toenails involve removal of the affected side of the nail and matricectomy, often with phenol,¹⁶ sodium hydroxide¹⁷ or wedge resection¹⁸ but may have certain disadvantages, such as prolonged wound healing or infection,¹⁹ restriction of everyday activities, scars, or deformations. Various authors have reported that patients prefer conservative treatments over invasive surgical procedures.²⁰⁻²² On the contrary, however, these treatments require collaboration and perseverance on the part of the patient and the professional who applies them, in cases of severe deformity their success rate is minimal, and they have high rates of recurrence of the pathology.

The hypothesis of this study was that the technique of nail remodeling is more effective than that of nail retraining with gauze bandaging. An inferential analysis made it possible to verify that there are indeed significant differences between the two techniques since there were more cases of recurrence observed at the follow-up visit in the nail retraining group than in the remodeling group. An explanation could be that in nail retraining the gauze bandaging is expelled as the days go by, while the remodeling gel has longer durability and, if it is to be removed, this must be done by the podiatry professional. In our case, the 1% clotrimazole contained in the treatment is not a possible treatment for onychomycosis due the difficult trans-nail drug delivery,²³ but a method to protect the prosthesis from fungi.

Some authors put the recurrence rate of nail remodeling at between 8.2%²² and 21.74%, compared with 91.67% in the retraining group.⁷ Hence, one observes that the recurrence rate of these studies is very similar to that of the present study, which is around 10%.

The pre-intervention inflammation, pain, and infection correspond to the usual clinical picture accompanying onychocryptosis of stage I and IIA according to the Mozena classification. After the intervention, inflammation is present in just 10% of the subjects in the nail remodeling group compared with 60% in the retraining group. Therefore, the symptomatology after follow-up is more pronounced in the retraining group, which could be related to the possible appearance of recurrence. This reduction in symptoms at 3 months is consistent with other authors, who found a reduction in pain in the first week after the application of the gel nail.²²

Patients with nail remodeling presented greater satisfaction with the treatment, which is related to the resolution of the pathology,

but also due to other aspects such as a better aesthetic appearance, comfort, and the simplicity of the gel nail technique. Nanda and Grover,²⁴ in a study with disfigured nails that received nail remodeling treatment, determined a degree of satisfaction of 9.08, a score close to that of the present study. Nonetheless, there have been few studies that assess patient satisfaction with the intervention performed, so we believe that this present study provides significant added value.

The use of the gel was chosen as a cosmetic product that can be found currently be found in many countries and with their 1% clotrimazole content, it would not be considered a treatment or a drug. If it is not available there are another acrylics, but many of them have in their composition toxic and flammable materials. So, the election of the alternative should be checked and choose products without methyl methacrylate, a toxic product also banned in some countries.

5 | CONCLUSIONS

Nail remodeling is a novel, easy-to-apply, economical, and functional treatment that shows itself to be longer lasting than nail retraining for the treatment of incipient onychocryptosis. In addition, it offers a better clinical result with reduced pain 3 months after its application, being more comfortable and satisfactory for the patient because it is painless and aesthetic at the same time. It is proposed as the first line of treatment in cases of mild onychocryptosis that require conservative treatment.

CONFLICT OF INTEREST

The authors declare no conflict of interests.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available in Aquilesia Centre at <https://www.aquilesiapodologia.es>. These data were derived from the following resources available in the public domain: <https://www.aquilesiapodologia.es>.

ETHICAL APPROVAL

The study complied with the requirements of the Helsinki declaration, being approved by the Bioethics and Biosafety committee (ID: 198A//2020) and registered at ClinicalTrials.gov with the number NCT05214586.

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How to cite this article: Martínez MTG, Gómez-Gabriel B, Martínez-Nova A, Gil PN. Comparative study between nail retraining with gauze bandaging and the nail remodeling with acrylics as a conservative treatment for stage I and IIa onychocryptosis. *J Cosmet Dermatol.* 2022;00:1-5. doi: [10.1111/jocd.15512](https://doi.org/10.1111/jocd.15512)