

## CONSEQUENCES OF WEDGE RESECTION PROCEDURE WITH A NEW SUTURE TECHNIQUE IN THE TREATMENT OF INGROWN TOENAILS

### Tırnak Batmalarının Tedavisinde Kama Şeklinde Çıkarımla Birlikte Yeni Bir Sütür Tekniğinin Sonuçları

Metin Temel<sup>1</sup>, Ebru Çelik<sup>2</sup>, Raif Özden<sup>3</sup>, A. Çiğdem Doğramacı<sup>2</sup>, Yunus Doğramacı<sup>3</sup>, Vedat Uruç<sup>3</sup>

<sup>1</sup>Mustafa Kemal Üniversitesi Tıp Fakültesi, Plastik ve Rekonstrüktif Cerrahi Anabilim Dalı, HATAY

<sup>2</sup>Mustafa Kemal Üniversitesi Tıp Fakültesi, Dermatoloji Anabilim Dalı, HATAY

<sup>3</sup>Mustafa Kemal Üniversitesi Tıp Fakültesi, Ortopedi ve Travmatoloji Anabilim Dalı, HATAY

#### ABSTRACT

**Aim:** The narrowing of the nail plate or debulking of soft tissues is the mainstay of the different surgical techniques used to treat ingrown toenails. However, neither of these methods is sufficient alone to treat all types of ingrown toenail. The aim of this study was to present a new surgical wedge resection procedure for an ingrown toenail that includes a definitive narrowing of the nail plate, debulking of the lateral fold and attachment of the remaining lateral fold to the nail plate using a novel suturing technique.

**Material and Methods:** Fifty two patients with grade 2-3 ingrown toenails were operated on. Twelve of these cases involved bilateral toes and 11 toes had bilateral lesions; 75 lesions on 64 toes were therefore surgically treated. Recurrence and cosmetic satisfaction were the main outcomes to be assessed.

**Results:** No recurrence was detected in any subject and all patients were satisfied with the cosmetic results.

**Conclusion:** Our new surgical procedure is a very effective alternative treatment for an ingrown toenail which produces excellent cosmetic results.

**Key words:** Ingrown toenail, surgical procedures.

#### ÖZET

**Amaç:** Tırnak batmalarında tırnak yatağının daraltılması ve yumuşak dokudaki şişliklerin giderilmesi birçok cerrahi müdahalenin ortak noktasıdır. Ancak bu cerrahi tekniklerin hiçbiri tek başına cerrahi tedavide yeterli olmamaktadır. Bu çalışmada amaç kama şeklinde etraf yumuşak dokuda eksizyon yapılarak tırnak yatağının daraltılması ve kalan yumuşak dokuların ise yeni geliştirilen bir sütür tekniği ile yeniden tırnak yatağı oluşturulmasını sağlamaktır.

**Gereç ve Yöntem:** Çalışmamıza sınıf 2-3 tırnak batması olan 52 hasta dahil edildi. Bu olguların 12'sinde her iki ayakta ve 11'inde ise aynı ayakta tırnağın her iki tarafında tırnak batması mevcuttu. Toplam 64 ayakta 75 lezyon cerrahi olarak tedavi edildi. Nüks ve kozmetik memnuniyet açısından sonuçlar değerlendirildi.

**Bulgular:** Hiçbir hastada nüks görülmedi ve tüm hastalar kozmetik sonuçlardan memnundu.

**Sonuç:** Yeni geliştirilen bu cerrahi tekniğin tırnak batması tedavisinde çok etkili, mükemmel kozmetik sonuçlar doğuran alternatif bir yöntem olduğunu düşünmekteyiz.

**Anahtar kelimeler:** Tırnak batması, cerrahi işlemler.

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İletişim: Yrd. Doç. Dr. Metin TEMEL Mustafa Kemal Üniversitesi, Tıp Fakültesi, Plastik ve Rekonstrüktif Cerrahi Anabilim Dalı, Hatay/Türkiye.

Tel: 0543 690 46 81 E-posta: [drmetintemel@hotmail.com](mailto:drmetintemel@hotmail.com)

## INTRODUCTION

Ingrown toenails are widely encountered among patients presenting to orthopedic, family medicine and dermatology outpatient clinics. Teenagers and young adults are mostly affected. The most common symptom is pain and difficulty in walking, which adversely affects patient quality of life. The pathology of an ingrown nail begins with the penetration of the lateral nail fold by the edge of the nail plate. This causes inflammatory responses, infections and granulated tissue formation (1). The primary cause of these conditions may be the nail plate itself or the bulky soft tissues of the lateral fold (2, 3). The most common predisposing factors for ingrown toenails are poorly fitting shoes, improperly trimmed toenails, excessive sweating and nail infections (4, 5).

Treatments of ingrown toenails differ according to the stage of the lesion, previous interventions, and recurrence of the lesion. Mild to moderate lesions with minimal erythema and no purulent drainage (Grade I-II) can be treated using conservative methods. Moderate to severe lesions (Grade II-III) and recurrent lesions with substantial granulomatous tissue and purulent drainage usually require surgical intervention (6, 7). Surgical techniques in these cases are mainly based on either narrowing of the nail plate or the debulking of soft tissues. Although there are numerous reported surgical methods for treating an ingrown toenail, none of these procedures is sufficient alone to treat all types of such lesions. However, these techniques can result in delayed wound healing, a poor cosmetic result, and recurrence of ingrowth (8,9). Hence the surgical approach changes

according to the type of pathology in these cases (2).

The aim of this study was to present the results of a new surgical wedge resection procedure for the treatment of an ingrown toenail and to compare other wedge resection techniques.

## MATERIAL AND METHOD

Patients with an ingrown toenail that were seen as outpatients at University Hospital Departments of Orthopedics, Plastic and Reconstructive Surgery and Dermatology were enrolled in the study. The study protocol was reviewed and approved by the ethics board of University and written informed consent was obtained from all patients. The surgical procedures were conducted by VU and MT. Lesions were evaluated according to the Heifetz staging system: grade I, swelling and erythema is present; grade II, additional wound drainage and infection is present; grade III, chronic inflammation, and granulation tissue formation is evident (10). Patients were classified according to this staging system.

From March 2011 to February 2013, this study started with 61 patients, but the patients with nail fungal infections (n:5), diabetes mellitus (n:3), circulating problems (n:1) in the same extremity and patients who refused surgery were excluded from this study. Then, the study included 52 patients with grade 2-3 ingrown toenails were operated on at our hospital

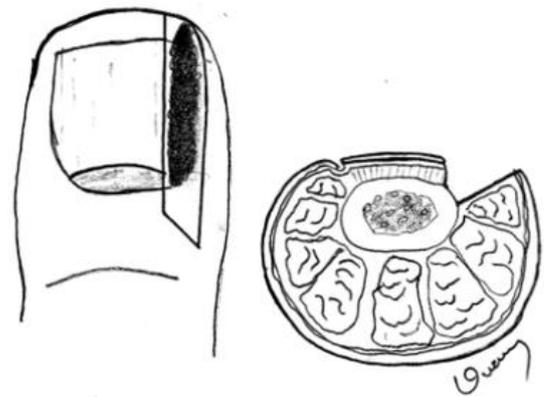
### Surgical technique and patient management

Prophylactic intravenous cefazolin was infused 30 minutes prior to surgery. Local anesthesia was performed with a digital nerve block (1% lidocaine). Surgical latex gloves were cut and used as a digital tourniquet. A longitudinal incision was made to the nail plate beginning 5

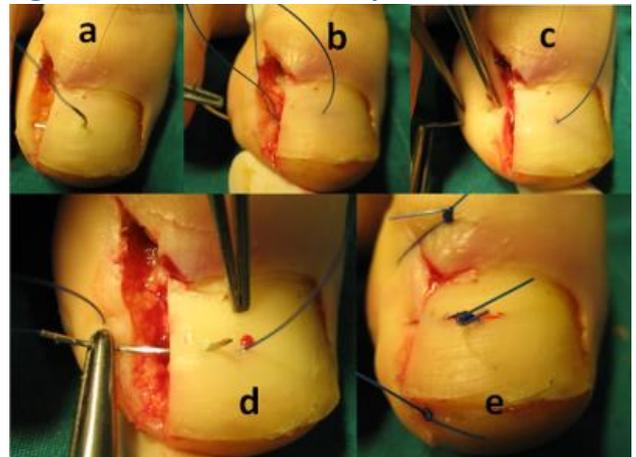
mm proximally to the eponychium and 3-4 mm far from the edge of the nail plate. A number 15 blade was used, and the incision was extended down to the bone. The proximal part of the incision was continued 5 mm proximally with a 45-degree inclined line. The proximal and distal ends of the incision were connected by an elliptic incision that included a small amount of normal tissue from the lateral fold. The latter incision was curved obliquely at a 45-degree angle to the initial incision to reach the most lateral margin of the germinal matrix (Fig. 1). After the wedge excision, the lateral horn where the germinal matrix is most likely to remain was cauterized using a monopolar tip at a 40-V setting. The wound was closed with 3/0 cutting polypropylene suture materials. The proximal part was closed with one vertical mattress or a plain suture. The middle of the remaining lateral fold was attached to the nail plate by a new suture technique: the first bite was made at the surface of the nail plate. The needle was passed through the nail plate and emerged from the wound and subsequently from the corresponding lateral fold. (Fig. 2a, 2b) The tip of the needle was then reversed and passed through the skin to emerge just near the edge of the wound. (Fig. 2c) This enabled us to recreate the normal anatomical curve of the lateral fold. Finally, the last suture bite was made at the middle of the distance between the first suture bite and the edge of the nail plate. (Figure 2d) The sutures were then tied on the surface of the nail plate. The distal corner of the wound was closed with one normal suture. (Fig. 2e) The tourniquet was removed, and fusidic acid was applied topically. The dressing remained in place for 24 to 48 hours. Cefaclor Monohydrate (1500mg/day)

was given orally for antibiotic prophylaxis over a 10-day postoperative period. Etodolac (800mg/day) was used for postoperative pain control. The sutures were removed at the end of the second week. The patients were initially followed up at one, three and six months after surgery and then at one subsequent visit.

**Figure 1. The shape of incision**

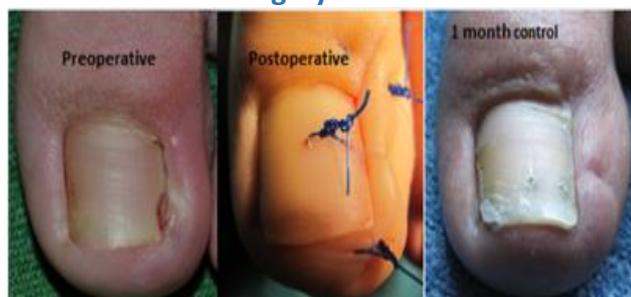


**Figure 2. The suture technique.**



**2a:** Starting from the middle of the nail surface. **2b:**The needle is passing through the corresponding lateral fold. **2c.** The tip of the needle is reversed and passed through the skin to emerge just near the edge of the wound. **2d.** The last suture bite at the middle of the distance between the first suture bite and the edge of the nail plate. **2e.** Final appearance.

**Figure 3. The appearance of an ingrown toenail before surgery, just after surgery and one month after surgery.**



## RESULTS

The authors included 75 lesions from 64 big toes from 52 patients (40 male and 12 female) in our current study. Of these, 25 had grade 2 and 50 had grade 3 ingrown nails, and 12 cases involved bilateral toes, and 11 toes had bilateral lesions. Sixteen of the patients had previously undergone surgery for ingrown nails. Forty-five of these lesions with active drainage and infection were treated orally for 10 days with 2000 mg/day cefaclor monohydrate prior to surgery. The median age of the patients was 31 years (range, 20-48). Patients were followed up for 10 months (range, 6-24 months). At each follow-up visit, the subjects were examined for recurrence, infection. No recurrence or infection was detected in any subject, and none of the patients required additional surgery during the follow-up period. The patients were interviewed to express their postoperative term satisfaction. They asked to evaluate their satisfaction as "Excellent, acceptable, poor". Their answers were rated, and 50 patients were assessed the postoperative results as "excellent". However, 2 patients were assessed as "acceptable." All of the patients reported that pain was substantially reduced after surgery, and foot-related quality of life was increased. The majority of patients involved in

the study were satisfied with the cosmetic results of our surgical treatment. Additionally the natural view of the nail and the lateral fold tissue (bulky) were evaluated by an independent dermatologist according to the postoperative pictures. Moreover, the dermatologist was asked to assess the results as "Excellent, acceptable, poor". The dermatologist reported the evaluation of the results 48 as excellent and 4 as acceptable.

## DISCUSSION

The skill of the surgeon is a critical determinant of the outcome of all surgical procedures. The best treatment of ingrown toenails should be an effective, simple, inexpensive outpatient procedure with little postoperative discomfort and a rapid return to normal activities. Moreover, low complication and recurrence rates with acceptable cosmetic outcomes are of great importance (11, 7). We believe that our technique covers most of these requirements. The anatomy of the nail matrix must be accurately determined, and all residue of the germinal matrix must be excised to prevent recurrence. In our novel surgical technique, the trapezoidal shape of the incision at the proximal side provided an excellent view of the germinal matrix and enabled us to remove it without any residue. Debulking of the lateral fold and our suture technique, which keeps the lateral fold under the nail plate, also contributed to the prevention of recurrence. Another aspect of our technique is that when the proximal part of the incision, which has a trapezoidal shape, is closed the lateral fold translates a little bit proximally. The distal corner of the lateral fold, which plays a significant role in the pathogenesis of an ingrown toenail, is thereby decompressed.

Plication of the skin with our suture technique contributed to the reconstruction of a normal anatomic convexity of the lateral fold that gave excellent cosmetic outcomes (Fig. 3). This technique is an easy surgical procedure and has several advantages, including no requirement for specific chemicals, or surgical tools and patients can resume work after the surgery.

Various methods have been used to treat ingrown or pincer-like (curved) toenails, including taping (12), cotton wool packing, (13) gutter treatment (14) with a tube (15) and with or without formable acrylic (16) 3TO (VHO-Osthold brace) treatment, (17) and surgical procedures (18, 7).

The conservative treatment approaches for the ingrown nails are chosen by dermatologists or family doctors. Moreover such conservative interventions results with frequent recurrences (19). The treatment materials cause dermatologic problems due to skin irritations (20). For the patients who are unsuitable for the surgical interventions or rejecting any surgical procedure, the conservative therapy techniques could be considered.

Surgical treatments of ingrown toenails are mainly based on definitive narrowing of the nail plate or debulking of the periungual soft tissues (2). Definitive narrowing of the nail plate can be achieved by chemical cauterization (21), wedge excision (22) ablative CO2 lasers (23-25) and radiosurgery (26). Techniques for debulking of the periungual soft tissues include the Howard-Dubois' procedure (27), Vanden Bos' procedure (28), super U technique (29), Noel's procedure [30] and Tweedie and Ranger's transposition flap (29).

Our current technique can be considered to be a type of wedge resection. Several variants of

our surgical method have been described such as the Winograd, Zadik, or Emmert procedures (31, 32, 17). The common feature of these proceedings is a bloc resection of the lateral part of the nail plate, and its corresponding bed and matrix and conflicting results from these approaches have been reported in the literature.

Huang JZ et al. (33) reported a study that they compared the Winograd technique with the total nail plate avulsion technique associated with wedge resection. They showed that there was not any significant difference between the two techniques from the aspect of recurrence. They stated that the Winograd technique was resulted with better cosmetic results. In our technique, the cosmetic results were satisfactory for both, the patient, and the surgeon. The simultaneous correction of the lateral nail fold by wedge resection and the destruction of the stem cells by cauterisation prevents recurrences. The nail plate avulsion technique has an adverse effect over the life quality of the patient and delays the beginning to the work. Thus, it is not a widely chosen technique. The healing time is too short than then the techniques, so our technique also shortens the return time back to daily life.

Aksoy B et al. (34) have reported a surgical technique for composing a lateral fold at the ingrown nail. Their technique is more invasive than the wedge resection, and them intervene mostly to the lateral fold. The authors have reported one flap failure. In their technique, the resection from the germinal matrix is limited to 2 mm for preventing the narrowing of the nail width. A 3% of recurrence is reported. In our technique, no flap is used for restoring the lateral fold. Thus, the healing

process is faster, and there is no complication risk depended on the flap failure.

Kayalar et al. reported good results with surgical block wedge resection (22). However, Kose et al. reported a high recurrence rate and poor cosmetic results with the Winograd technique (32). The recurrence rate of wedge resection is reported at between 6.5% and 20.4% (22, 32, 35, 36). Lower recurrence rates have been reported with chemical matrixectomy (36, 37), but a higher postoperative infection frequency is reported (38). In our current study series, no recurrences were detected during the follow-up period, and all patients were satisfied with the cosmetic results. We think that destructing the germinal matrix cells by monopolar cauterization or chemical matrix ectomy is associated with the absence of the recurrence.

Good outcomes have also been reported for soft tissue debulking procedures (27, 28, 30, 34). Noel et al. reported a complete cure in 23 ingrown toenail patients treated with a vertical wedge shape resection procedure. The incision in that technique resembles the one we use in our new surgical method but includes only the soft tissue of the lateral fold without any part of the nail plate or matrix (30). In our technique, the excess tissue of lateral fold is removed.

In the "Knot Technique" study of Ince B. et al. (39), they use only the suspension force of suture. They resected only the tissue excess of the lateral fold without excising the in growing part of the germinal matrix at the lateral aspect of the nail. Then they suspend the lateral of the nail by suturing by monofilament polypropylene suture. The long-term recurrence is inevitable if there is a lack of germinal matrix resection at the lateral aspect

of the ingrowth nail. Moreover, the monofilament sutures have a higher opening potential and tensile power reduction. In our study, the technique is depended on the restoration of the lateral nail tissue than the tensile strength of sutures. As a result, we achieve a flat surface for nail location.

Rusmir et al. retrospectively reviewed the postoperative infection rate after toenail matrixectomy and found high rates of clean foot surgery. Routine antibiotic prophylaxis after surgery is, therefore, warranted (40). In our present study, no infection arose in any of our patient subjects during the postoperative period.

The inadequate number of the patients and excluding the patients with comorbidities such as fungal infections, diabetes and peripheral vessel diseases due insufficient patient number are the limiting aspects of this study. Furthermore, the study includes only the healthy individuals. It is also a limiting factor the limiting factors of the study can be eliminated by increasing the number of the patients with and without comorbidities.

In conclusion, our novel surgical procedure for an ingrown toenail is an alternative treatment approach that is very effective and produces excellent cosmetic results.

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