



# The “Extreme Atasoy” flap

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Received: 3 April 2019 / Accepted: 4 July 2019 / Published online: 15 July 2019  
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## Abstract

**Background** Distal finger injuries are very common in Hand Surgery. The purpose of this paper is to describe our “Extreme Atasoy flap” technique in the reconstruction of apical lesions of the fingers.

**Methods** Twenty patients were treated with the “Extreme Atasoy flap” technique. The following variables were evaluated: age, sex, comorbidity, cause of amputation, Visual Analogue Scale for pain assessment to time 0 (VAS T0), VAS to time 30 days (VAS T30), hospitalization time (HT), time to heal (TH), major complications (MC), minor complications (mC), advancement flap (AF), and static 2-point discrimination test to assess sensitivity.

**Results** In our case series, no major complications were present. The average healing time was 2.4 days, and the 2-point discrimination test regarding sensitivity was satisfactory. The patients reported good aesthetic and functional outcomes.

**Conclusions** Treatment of fingertip injuries is an important topic in Hand Surgery. Local flaps are common forms of treatment in these kinds of injuries. The surgical technique is similar to that described by Atasoy, but with some important differences: the preoperative design is different, the donor site is not closed with stitches but heals by secondary intention, and the vascular pedicles are extremely skeletonized. This technique has proven to be safe and simple to carry out and provides good coverage of the distal portions of the fingers.

Level of Evidence: Level V, therapeutic study

**Keywords** Atasoy · Finger amputations · Finger lesions · Apical amputation · Finger reconstruction · Local flaps · Tranquilli-Leali flap

## Introduction

The loss of substance of the fingers is an important sector of Hand Surgery [1]. Various conditions can lead to the apical amputations of the fingers: trauma, infections, and neoplastic disorders [2]. Different reconstructive techniques have been used from simple skin grafts to local cutaneous or adipose-fascial flaps, dermal matrix or microsurgery techniques [3–7]. For dorsal, oblique, and transverse amputations, the Atasoy V-

Y advancement flap is a common choice that preserves sensitivity, finger length, and function. However, the intrinsic limit of the Atasoy flap is that it cannot be extended further than 1 cm [8–11]. Therefore, in our Plastic Surgery Department, we often use the “Extreme Atasoy” technique for apical finger coverage. Compared with the traditional technique, we have developed some modifications that allow us to advance the flap by as much as 18 mm.

The purpose of this paper is to describe our “Extreme Atasoy” technique.

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s00238-019-01550-w>) contains supplementary material, which is available to authorized users.

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## Materials and methods

From January 2011 to January 2017, we performed 180 surgical procedures with the “Extreme Atasoy flap”, with an advancement of the flap greater than or equal to 10 mm. We present a case series of 20 patients who were treated using this technique.

The following variables were analysed: age, sex (0 for male, 1 for female), comorbidity, cause of amputation,

Visual Analogue Scale Pain (VAS) to time 0 (VAS T0) (range 0–10), VAS Pain to time 30 days (VAS T30), hospitalization time (HT), time to heal (TH) (intended as complete healing), major complications (MC), minor complications (mC) (partial necrosis of the flap, onychodystrophy, neuroma, and sensitivity disorders), and advancement flap (AF). For the evaluation of sensitivity, the 2-point static discrimination test was applied. The follow-up period was 12 months in all cases.

In this study, we have focussed on the following variables: hospitalization time, time to heal, VAS T0–T30, MC, mC, and amputation causes. Furthermore, we have analysed the correlation between the advancement flap and these variables to show the safety level of this reconstructive choice.

Additional informed consent was obtained from all individual participants whose identifying information is included in this article.

### Surgical procedure

All the patients underwent ultra-short antibiotic prophylaxis (2 g of cefazolin iv). After peripheral block anaesthesia, the dissection technique was carried out using  $\times 3.5$  loupe magnification.

Using a dermatographic pencil, we drew a “U” shape preoperative design from the fingertip and perionychium up to the distal interphalangeal fold (DIP); if necessary, the design can be drawn at a lower point (Fig. 1a). An incision was made with scalpel 15 until the subcutaneous tissue (Fig. 1b). The flap was dissected with “Reynolds”-type scissors, making perpendicular movements to the cutaneous incision and parallel to the fibrous septa. Using the scissors, we skeletonized the terminal segments of the vascular pedicles until satisfactory coverage

was achieved. The flap was then detached from its deep and lateral connections, saving the sheath of the deep digital flexor tendon (DDFT) at its insertion (Fig. 1c). The skeletonization of the flap can be extreme, obtaining advances of even about 2 cm (Fig. 2a). The donor area was left open and healing occurred by secondary intention. The wound was dressed with a single layer of non-adherent dressing ADAPTIC™; this is a primary wound contact dressing designed to minimize wound adherence, consisting of a knitted cellulose acetate mesh impregnated with a specially formulated petrolatum emulsion. We changed the dressing every 3 days so as to promote healing and reduce pain when changed (Fig. 2b).

The average surgical time was about 6 min (range 3–10 min). All patients were treated in immediate or deferred emergency hospital care (within 48 h from the trauma).

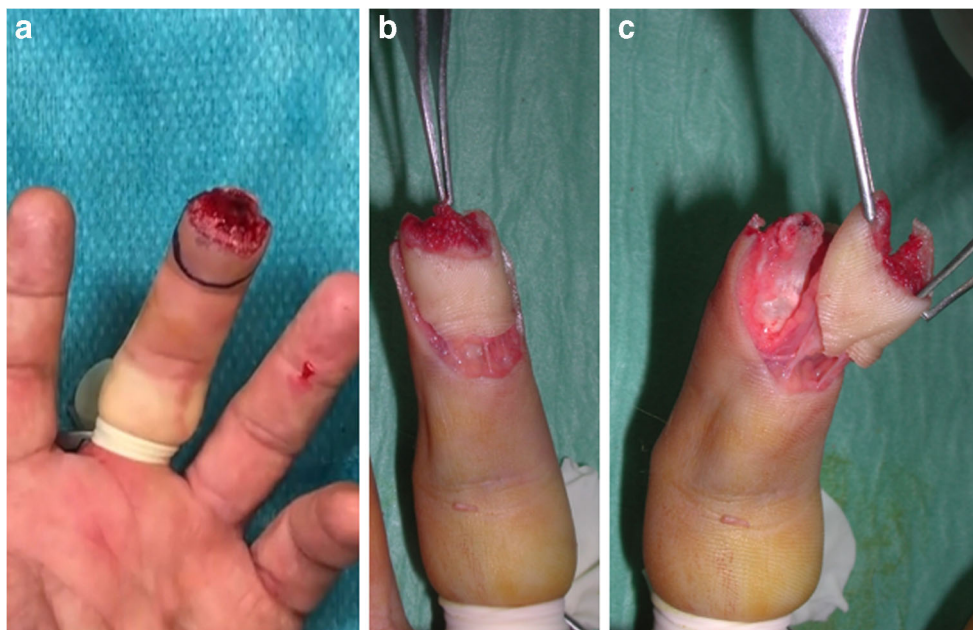
### “Extreme Atasoy” clinical case

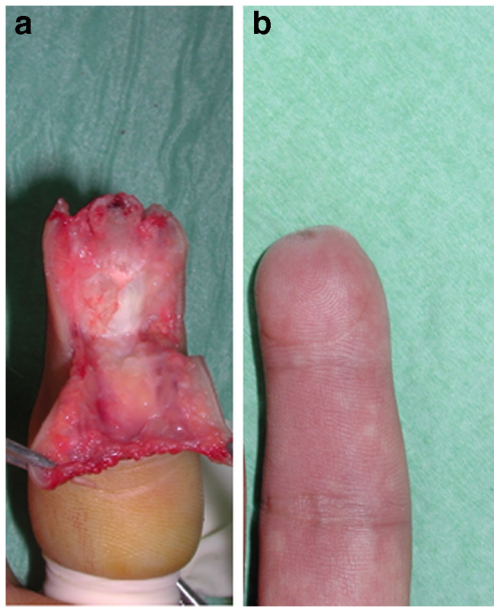
Man, 65, amputation of the III finger in zone 2/3 following crushing injury, according to Allen’s classification, with exposure of bone and loss of substance of about 1.3 cm (Fig. 3a). We performed the “Extreme Atasoy” technique and the flap was advanced by 18 mm (Fig. 3b) At the clinical check after 7 days, the donor site appeared to be granulating, covering the DDFT sheath (Fig. 3c). The postoperative check was carried out after 30 days (Fig. 4a, b).

### Results

In our case series, we treated 19 males and 1 female, with a mean age of 40.5 (range 21–71); 4 patients had comorbidities

**Fig. 1** a Mark of Extreme Atasoy flap. b Incision is made with scalpel 15 until subcutaneous fat is reached. c Skeletonization of the terminal segments of the neurovascular peduncles in the Extreme Atasoy flap for fingertip coverage





**Fig. 2** a Harvesting of Extreme Atasoy flap. b Photographic check after 40 days

such as diabetes ( $n = 1$ ), arterial hypertension ( $n = 2$ ), and ischemic heart disease ( $n = 1$ ). Causes of traumatic amputation are as follows: crushing injury (80%) and cutting lesion (20%).

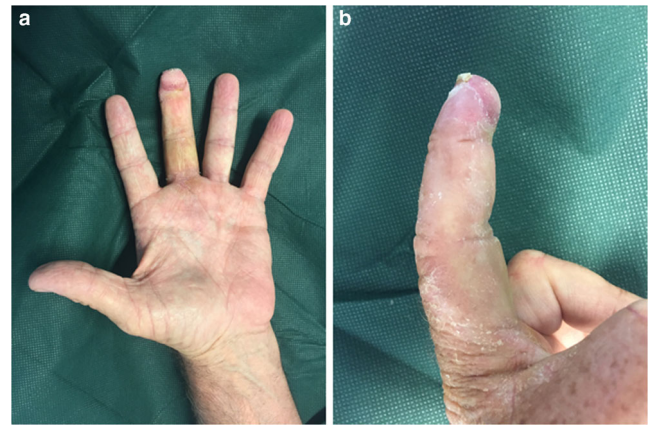
In Table 1, we investigated the following variables: age, sex, advancement flaps, hospitalization time, time to heal, mC, MC, and causes of amputation. The sample was statistically homogeneous for the continuous variables (Table 1).

Hospitalization times: the mean value was 2.4 days, the average value of VAS T0 was 8.25, and VAS T30 was 1.8.

Regarding the correlation between the advancement flap and the other variables, the only variable that is related to the advancement flap is minor complications



**Fig. 3** a Man, 65, trauma from crushing of the III finger with amputation of the fingertip. b Extreme Atasoy technique; the flap is advanced by approximately 18 mm. c After 7 days, the donor site appears to be granulating, covering DDFT sheath



**Fig. 4** a Postoperative check after 30 days. b Lateral view postoperative check after 30 days

mC. In this case series, patients who underwent the “Extreme Atasoy” advancement procedure had a higher rate of minor complications (mC). Nevertheless, this did not preclude a good final result. The static 2-point discrimination test to assess feeling showed average values of 4.2 mm for the series with good sensory recovery.

**Table 1** Characteristics and outcomes of enrolled subjects

Variable	“Atasoy Extreme”
Age, years	
Median (IQR)	40.5 (21.0–71.0)
Male, $n$ (%)	19 (95.0)
Advancement flap (mm)	
Median (IQR)	13.5 (11.0–18.0)
Hospitalization time, $n$ (%)	
2 day	13 (65.0)
3 days	6 (30.0)
4 days	1 (5.0)
Time to healing, days	
Median (IQR)	17.0 (14.0–22.0)
mC	
0	12
1	8
MC	
0	19
1	1
Causes imputation	
Crushing	16
Cutting	4

The variables analyzed are age, sex, advancement flap, hospitalization time, time to healing, mC, MC, causes amputation. IQR, interquartile range

## Discussion

Fingertip amputations are very frequent in Hand Surgery after traumatic injuries [2]. Many reconstructive choices have been described, ranging from bone shortening and nail-matrix ablation, re-plantation of the amputated part or microsurgical techniques [9–11].

The goal of a good reconstructive technique is to preserve feeling in the fingers and the function and length, and also enable a speedy return to work.

Local skin flaps represent a valid choice in the treatment of fingertip amputations. The classic V-Y flap, described first by Tranquilli-Leali and subsequently by Atasoy, remains a current and often used choice [3–5]. The limit of the V-Y advancement flap, as described in the literature, is a loss of substance that needs an advancement of the flap of more than 1 cm. This technique preserves the length of the finger, offers adequate tissue coverage, and is safe and easy to perform. Among the key points in the execution of the technique, care must be taken to position the flap without tension and not to use an excessive number of stitches. [8–11] Thoma et al. reported their cases of V-Y advancement flap and concluded that the partial or total necrosis of the flap was higher when the procedure was carried out by residents [12]. The authors modified the technique, allowing the donor area to heal by secondary intention in order to reduce the tension on the flap [12]. In the “Extreme Atasoy flap” technique, we also let the donor site heal by secondary intention, but, unlike Thoma et al., we used a “U” shape flap. In our experience the rounded shape of the proximal portion of the flap gives a better scar result, that can be hidden in the distal interphalangeal fold.

The classic Atasoy flap was carried out to the maximum extreme with this technique. The key points of this modified technique are as follows: preoperative design, secondary intention healing of the donor site, and the extreme skeletalization of the neurovascular pedicles.

## Conclusion

The V-Y advancement flap described by “Tranquilli-Leali” and revised by “Atasoy” remains a safe and popular choice [3–5].

We have developed the “Extreme Atasoy flap” to cover apical injuries of the fingers that require the flap to be extended more than 1 cm with no need for general anaesthesia or further surgical procedures, and with minor risk of failure.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

**Ethical approval** All procedures performed were in accordance with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

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