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## RESEARCH ARTICLE

# EFFECTIVENESS OF FINGER TIP RECONSTRUCTION THROUGH ATASOY VY ADVANCEMENT FLAP

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### ABSTRACT

**Introduction:** Traumatic injuries of the hand are an important aspect in the practice of the reconstructive surgeon. The objectives of finger tip reconstruction include the restoration of length, strength, position, stability, mobility, sensitivity and aesthetics of the finger. There are multiple reconstructive options for finger tip reconstruction. The objective of this study is to determine the effectiveness of the Atasoy VY advancement flap as a first line option for the reconstruction of fingertip defects. **Methods:** The following study is a retrospective, cross-sectional, observational and analytical study. A representative sample of patients presenting a diagnosis of digital tip lesion treated during the period from January 1, 2016 to December 31, 2018 in our plastic and reconstructive surgery service. **Results:** The finger tip reconstruction through Atasoy VY advancement flap in this study showed an effectiveness of 96.86 percent. In the 138 cases studied, there were only complications in 7 patients. The major complication that occurred was necrosis presenting in 4 flaps, followed by wound dehiscence in 2 flaps and the complication that presented less was the surgical site infection presenting in 3 patients. No patient presented loss of sensitivity. **Conclusions:** The Atasoy VY advancement flap is a simple and safe technique with greater effectiveness compared to other surgical techniques that achieves reconstructive objectives with advantages over other flaps.

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## INTRODUCTION

Traumatic injuries of the hand are an important aspect in the practice of the reconstructive surgeon. Late recognition or improper management of hand injuries can have long-term consequences for the quality of life, function and labor productivity of patients<sup>1</sup>. Fingertip injuries are defined as those distal to the insertion of the deep flexor and extensor of the fingers and represent about 50% of all hand injuries<sup>2</sup>. The highest priority to preserve function, sensitivity and aesthetics is the immediate coverage of the wound. For reconstruction, various reconstructive procedures are commonly used<sup>3</sup>. Skin grafts, VY advancement flaps, the different modalities of crossed finger flaps, inguinal flaps, retrograde and antegrade pedicle homodigital flaps, are some of the techniques available for fingertip reconstruction<sup>4</sup>. The pulp is the area of the finger with the highest density of sensory endings, which constitute the first link between our central nervous system and the external environment as far as tactile sensation is concerned<sup>5</sup>. The objectives of fingertip reconstruction include the restoration of length, strength, position, stability, mobility, sensitivity and aesthetics of the finger. It is a rare event when all these objectives can be achieved, and the prioritization must be based on the objectives and functional demands of the patient<sup>6</sup>.

There are multiple reconstructive options for fingertip reconstruction such as a finger reshaping, graft reconstruction, a crossed finger flap, among others. However, a reconstructive option is needed that provides quality coverage with sensitivity due to the sensitive nature of the finger pulp, that the length of the fingers is preserved and has adequate rehabilitation, which is early, so that the patient returns to work as soon as possible. The objective of this study is to determine the effectiveness of the Atasoy VY advancement flap as a first line option for the reconstruction of fingertip defects.

## MATERIALS AND METHODS

The following study is a retrospective, cross-sectional, observational and analytical study. The study was approved by the Institutional Ethics Committee. A representative sample of patients presenting a diagnosis of digital tip lesion treated during the period from January 1, 2016 to December 31, 2018 in our plastic and reconstructive surgery service were chosen randomly based on the calculation of the sample size. The sample size was obtained based on figure 1, where Z = Confidence level (1.96), P = Probability of success or expected proportion (90%), q = Probability of failure (10%), d = Accuracy (maximum permissible error in terms of proportion) (5%). All patients with a diagnosis of finger tip injury managed by Atasoy VY advancement flap and patients who are over 18 years old and under 99 years old were included. Patients diagnosed with a finger tip injury

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undergoing another type of reconstructive management other than a VY advancement flap and patients under 17 years and over 100 years were excluded. Age, gender, defect size, location of the lesion, etiology and complications were the variables to study.

$$n = \frac{Z_a^2 \times p \times q}{d^2}$$

Figure 1. Formula for sample size

Demographic data will be collected, statistical analysis corresponding to the variables will be carried out. The effectiveness of the Atasoy VY advancement flap will be determined in comparison with other surgical techniques. The effectiveness will be obtained according to the formula in Figure 2.

$$\frac{\text{Number of people benefited}}{\text{Target population}} = \frac{(\text{patients without complications}) / (\text{total of patients attended by the technique used})}{0.98} \times 100$$

Figure 2. Formula to measure the effectiveness of the Atasoy AY flap

## RESULTS

A total of 138 patients were included. It was observed that the fingertip injury in this study was more frequent in patients from the second to third decade of life, with an age range from 19 years to 83 years with an average age of 35 years. Men presented more fingertip injury with a total of 83 cases (60.14%) compared to women with a total of 55 cases (39.86%) as we can see in Figure 3. The most fingertip injured area was zone III, presenting in 52 patients (15.95%), followed by zone II in 37 patients (26.81%), zone I in third place in 29 patients (21.01%), the least fingertip injured area was zone IV presenting in 20 patients (15.94%) this represented in Figure 4. The fingertip reconstruction through Atasoy VY advancement flap in this study showed an effectiveness of 96.86 percent. In the 138 cases studied, there were only complications in 7 patients shown in figure 5. The major complication that occurred was necrosis presenting in 4 flaps, followed by wound dehiscence in 2 flaps and the complication that presented less was the surgical site infection presenting in 3 patients this is shown in figure 6. No patient presented loss of sensitivity.

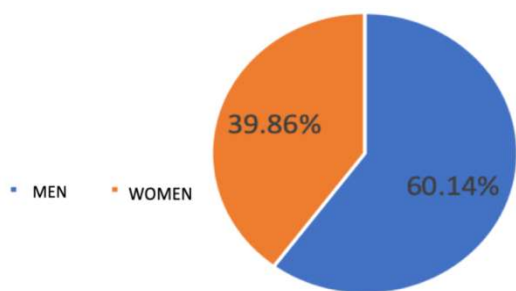


Figure 3. Gender distribution

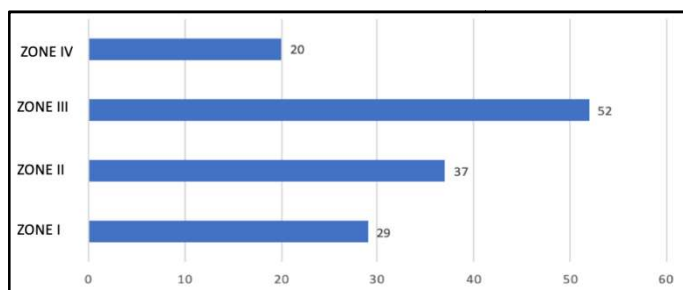


Figure 4. Fingertip injury localization

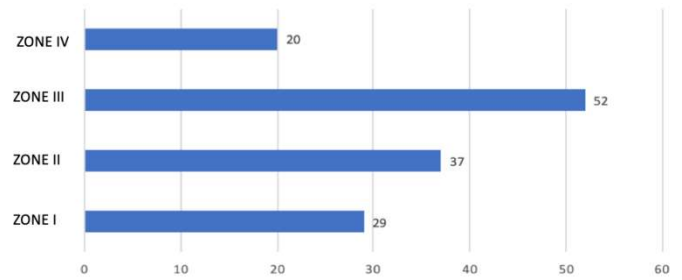


Figure 5. Fingertip injury localization

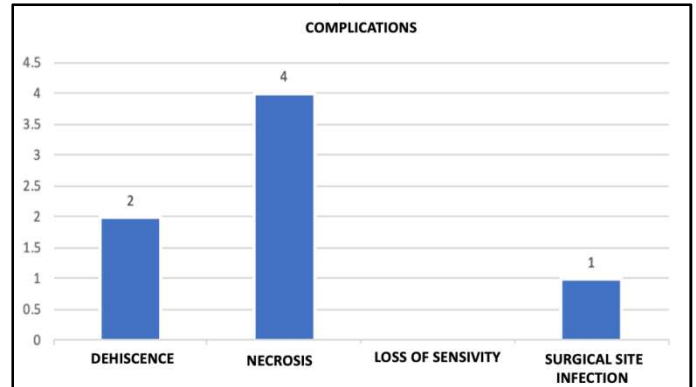


Figure 6. Complications in Atasoy VY advancement flap for fingertip reconstruction

## DISCUSSION

Allen and Dautel<sup>7</sup> classify injuries in four zones or levels. This classification is very important because it allows you to choose a possible method of coverage. The zones are determined from the distal to the proximal part: zone I, distal amputation, without exposure of the phalanx, involves only skin and subcutaneous cellular tissue; zone II, the section crosses the nail bed, but preserves a suitable length to allow the growth of nail without deformity in "parrot beak"; zone III, the level of amputation is close to the proximal nail groove and the area of the matrix, at this level it is not possible to preserve part of the nail bed without the phenomenon of "parrot beak nail"; zone IV, the amputation is proximal to the interphalangeal line, in this area it is possible to perform venous anastomosis, because dorsal veins are found and reimplantation is viable. One way to determine the reconstruction of the fingertip to be performed is based on the loss of soft tissue without bone exposure. If it is less than 50%, flap requirement or conservative management with targeted healing should be evaluated. If there is loss of soft tissue without bone exposure greater than 50%, it is recommended to perform local advancement flaps. In the literature, several types of flaps are described that have the particularity of achieving the cover of the finger tip of the affected finger<sup>8</sup>. The VY flap for fingertip reconstruction was described by Tranquilli-Leali in 1935, and subsequently popularized by Atasoy in 1970. It is a triangular flap of palmar advance, with VY design, nourished by the distal anastomotic arcade vessels of the digital arteries<sup>9</sup>. It is a neurovascular flap, of easy execution and minimum morbidity. The donor zone is the region flying from the pulp between the defect and the digital fold of the distal interphalangeal joint. It is indicated in transverse or dorsal oblique amputations, distal to the nail groove. Logically, it is contraindicated in palm oblique amputations due to the absence of a donor area<sup>10</sup>. This flap has as advantages its usefulness in any of the fingers of the hand, the preservation of the sensitivity and length of the finger providing a skin of equal characteristics to that of the pulp; It is a simple surgical technique with good functional and aesthetic results, it also leaves a low morbidity in the donor area. On the other hand, the possible secondary deformity of the nail is presented as a disadvantage when the flap is sutured to the nail bed, the flexural contracture of the distal interphalangeal joint, the risk of

partial necrosis of the flap in case of tension closure, contour deformities, some type of vasculopathy and rarely dysesthesias in the pulp<sup>11</sup>. Those cases in which there is no bone exposure can be solved with a skin graft, grafts obtained from the amputation fragment of choice when these are viable<sup>12</sup>. If sufficient vascularized tissues exist in areas adjacent to the wound, they will be preferable for coverage against grafts. Perilesional flaps can be used by designing a detachment in favor of the neurovascular axes<sup>13</sup>. In comparison with other flaps for coverage of distal finger defects, the VY flap, with an effectiveness of 92% as described by Mendoza<sup>14</sup> provides a greater donor area compared to that of Kutler that has a poor advance and only covers small defects due to its small size<sup>15</sup>. This effectiveness is similar to 96.86% that we obtained in our study. Tenarian flaps are contraindicated in covering defects in fingers four and five or some other pathology that may predispose to joint stiffness. Similarly, the cross-finger flap is also at risk of joint stiffness<sup>16</sup>. The Littler flap with an effectiveness of 76.9%<sup>17</sup>, requires the sacrifice of a digital artery itself and is contraindicated on the radial side of the index and the ulnar side of the small digit due to arterial and sensory dominance of the fingers, a significant morbidity that does not present the flap in VY<sup>18</sup>. Other flaps such as the flap based on the first dorsal metacarpal artery also called a comet flap have an effectiveness of 92% and the digital perforating artery flap an effectiveness of 80%<sup>19</sup>.

## CONCLUSIONS

The Atasoy VY advancement flap is a simple and safe technique with greater effectiveness compared to other surgical techniques that achieves reconstructive objectives with advantages over other flaps provides tactile sensitivity, presenting few complications. It is an easy technique to perform with good results for the management of fingertip injury.

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