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## Original article

## Place of the reposition flap in the treatment of distal amputations of the fingers

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## ABSTRACT

**Purpose:** Distal finger amputations pose a therapeutic problem with the distal fragment quality. Reimplantation remains the reference treatment for functional and aesthetic recovery of the hand. The interest of this study is to propose the reposition flap as an alternative to different hedging techniques in the proximal stump, in many situations where revascularization is impossible. It consists in osteosynthesis of the bone fragment and its coverage by a pedicled local flap.

**Methods:** The technique of reposition flap was evaluated retrospectively between 2003 and 2016 through a study of 13 patients compiled in Nabeul orthopedic department. For each patient, the sensitivity, the pulp trophicity, the interphalangeal mobility, the digital length, the appearance of the nail and radiological consolidation were evaluated.

**Results:** The reposition flap keeps more than 80% of the length of p3. This procedure improves nail aesthetics in comparison with the regularizations. There is no significant difference in sensitivity of the pulp or of the mobility of the distal inter-phalangeal (DIP) joint as a function of the technique studied. However there is a significant difference in average test of the Quick Dash (350 against 500 for regularizations).

**Conclusion:** The reposition flap seems to be a good alternative to regularization in the context of *trans*-p3 fingers amputations, in which the distal fragment is not revascularizable. It allows better aesthetic and functional results.

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## Introduction

The distal finger amputations are a common entity in traumatology of the hand and pose a therapeutic problem. Several technical processes are currently available ranging from simple regularization of the stump to the replanting and toe transfer. The reposition flap can be a surgical alternative and it is part of the armamentarium of hand surgery as well as isolated regularization and the coverage of the stump with a local flap. This reconstruction consisting in a flap associated with a bone-nail bed complex free graft has a primary purpose to allow the preservation of digital length but also most of the nail unit and its aesthetic aspect.<sup>1</sup> However, this technique suffers from a bad reputation, critics blamed a significant rate of claw or nail dystrophy of joint stiffness or lack of digital length.

The aim of this study is to evaluate the results of the treatment of the distal finger amputations and mainly the technique of reposition flap between 2003 and 2015 in the surgical unit of the hand in Maamouri Nabeul Hospital. This surgical method is compared to the main surgical alternatives such as reimplantation, which represents the reference technique, regularization and coverage with a flap on failure reimplantation or technical impossibility of digital revascularization.

## Materials and methods

We conducted a prospective study from 2003 to 2016 on a series of 13 patients with distal finger amputation surgically treated at the hospital Maamouri Nabeul in Tunisia.

As the nail tablet avulsed is kept in saline, we perform an economical trimming of the nail bed and complete excision of all skin tissue and subcutaneous retaining only the bone segment on which the nail bed remains inserted. No action should lead to the separation of the complex bone nail bed.

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The bone segment is also trimmed to obtain a bleeding bone, then it is fixed to the digital segment by an intramedullary pin and an anti-rotation pin avoiding bridging the remote infected tissue, and then it was covered by a pedicled local flap.

We evaluated our results of several clinical, functional and radiological criteria. The pain was quantified from 1 to 10 using the visual analogue scale.

**Skin condition:** Local signs of necrosis were sought such as scar inflammation, abscess, suspect flow, the color of the flap and the nail bed, the appearance of the nail (nail claw, no nail regrowth or short nail).

**Assessment of mobility:** for each digital segment, we realized the sum of the mobility of the metacarpophalangeal (MCP) joints, proximal inter-phalangeal (PIP) joint and distal inter-phalangeal (DIP) joint flexion and passive and active extension. This calculation was used to define a possible digital mobility deficit and its sector (flexion or extension). A patient with no mobility deficit had a digital mobility of 270°, for the thumb we used Kapandji's score.

**Millimeter measurement of digital repositioned segments:** Measurements of grip strength was taken with the Jamar dynamometer and compared to the healthy side.

The study of the sensitivity measured by three quotations (Weber, monofilament and sensitivity).<sup>2,3</sup> The patient was also asked about his cold tolerance.

**The accuracy of rework dates, sports activities and the level of recovery:** A quick DASH (disabilities of the arm, shoulder and hand) test was filled by each patient, allowing a subjective measure of the impact of trauma on the patient. This evaluation was performed for each patient with the largest decline to approach the final clinical outcome.

After clinical examination, we had accurate information about pain and their headquarters, strength, active & passive mobility and in particular the existence of a bending stiffness, intolerance to cold, the resensitization quality, aesthetic appearance of the finger or the nail regrowth. It was then asked to the patient to clarify his subjective satisfaction following treatment and its results. Radiographs allowed measuring the length of the fragment repositioned; bone resorption was quantified and a possible osteolysis was noted.

## Results

Our series consisted of 13 patients, with the mean age of 30 years ranging from 5 to 57 years. There were 10 men (90%) and only 3 women (10%). The 13 patients were right-handed. Seven patients were smokers and 6 had never smoked. They present neither significant cardiovascular antecedent nor long-term anticoagulation taken. Amputations occurred after crushing wound in 3 cases, by whirligig in 4 cases, by tearing off in 3 cases and finally in 3 cases with circular saw. Six amputations did not correspond to whistle or sausage amputation. Section during crushing or by spinning wound resulted in irregular amputations, delaminated escaping the usual descriptions. Among the last four, it was 2 ulnar amputations in whistles, radial amputation and amputation in sausage. We noted two amputations of *Trans*-p2 of the thumb, 5 amputations of *Trans*-p3 of the index, a major amputation of *Trans*-p3, 2 amputations of *Trans*-p3 and amputation of *Trans*-p2 of the ring and 3 amputations of *Trans*-p3 little finger amputation. The surgical management was after 12 h on average with extremes of 6–36 h. We made a digital Chinese flap in 7 cases; homodigital antegrad-flow neurovascular pedicle flaps in two cases, two flaps at once: a Littler flap levied on the middle finger and a dorsal intermetacarpal flap for an avulsion of the ring and one Atasoy flap. As regards the thumb, we used a dorsoradial flap in one case and a Moberg-O'Brien flap in the other case. We lamented partial necrosis of the nail bed in one case, partial necrosis of a Chinese digital flap in one case and one patient had a partial resorption of bone fragment without the appearance of the nail claw. Five of the ten patients had cold intolerance. Nail dystrophy was observed in 3 patients. The mean follow-up was of 28 months, with a range of 15 days–42 months. Clinically, no patient was painful or consuming painkillers. On inspection, no nail claw has been found. All nails have grown back. Three patients had dystrophy and a short nail but with a short recoil less than one year. The average mobility of the DIP joint was 54°, with a range of 30°–80° the PIP joint was 87°, with a range of 70°–100°. The average total active motion was 238° (200°–270°). The average score for Kapandji thumb was 9. The difference in average length compared to the contralateral healthy finger was 4 mm. There were only 3 cases of pain on percussion (Figs. 1–4).

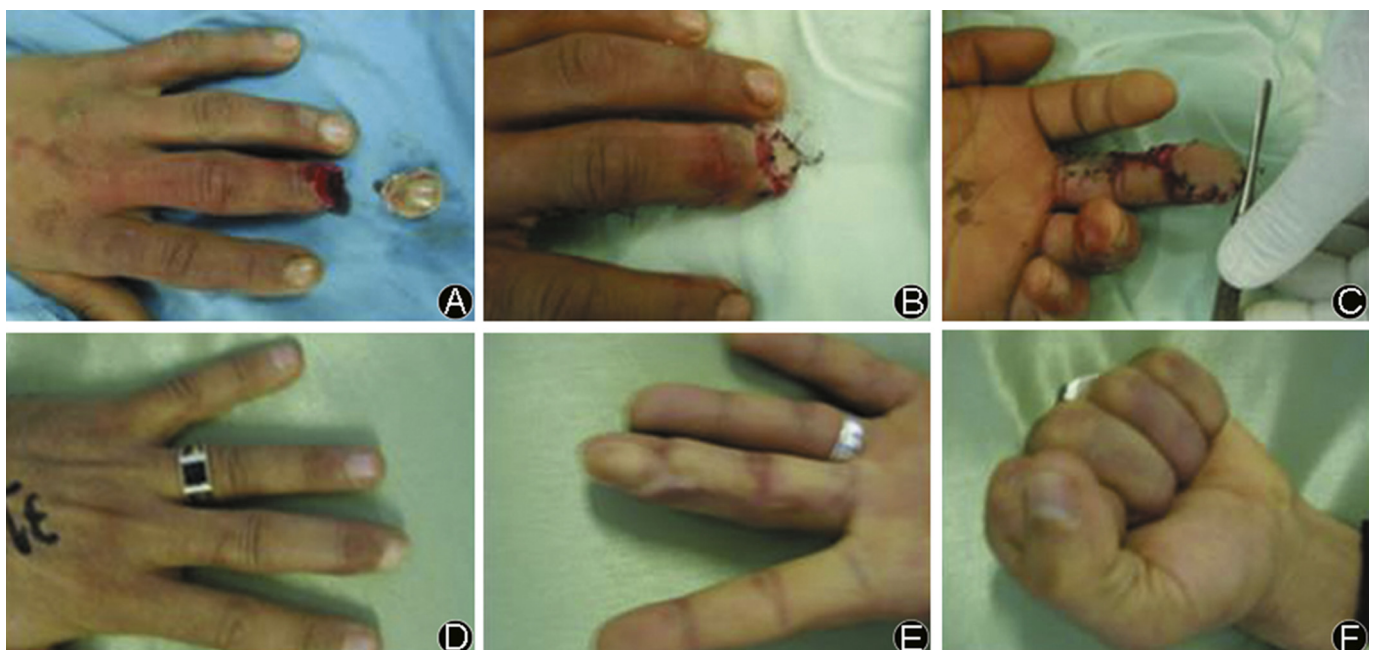


Fig. 1. Case 1: Amputation of the distal left middle finger using a flap reposition advancement island flap with a good result.

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