

## Case Report

# Random pattern sub-clavicular flap in digital degloving injuries: an alternative in the reconstructive ladder

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### ABSTRACT

Degloving soft tissue detachment injuries occur when the skin and subcutaneous tissue detach from the underlying structures, affecting the skin coverage. The hand is usually the most frequent affected site. In digital lesions, the best results are obtained by revascularization; nevertheless, this procedure is challenging for the surgeon. Random pattern flaps represent an effective alternative for the treatment of these devastating lesions. We present two clinical cases with digital degloving injury from the proximal phalanx. Both cases required reconstructive surgery in 2 stages, using a successful random pattern sub-clavicular flap. This article aims to share the results of using this method as another reconstructive option with good results. After an average follow-up of 8 months in both cases, adequate skin coverage and functionality of the finger treated with the described flap was observed. Patient A presents a finger with proper healing and functionality. Patient B at 10 months, presents a thumb with adequate length for clamping and opposition. Sub-clavicular flap is an excellent reconstructive alternative for digital degloving injuries where revascularization is unattainable, providing good skin coverage and functionality and being a reproducible outpatient procedure.

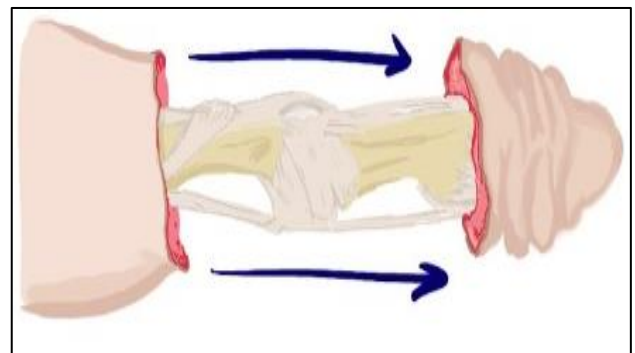
**Keywords:** Digital degloving injuries, Reconstructive surgery, Flap

### INTRODUCTION

Degloving injuries occur when the skin and subcutaneous tissue detach from underlying structures, affecting skin coverage and tissue blood supply.<sup>1</sup> Such injuries are generally secondary to high-energy trauma powerful enough to detach the vessels and subcutaneous tissue (Figure 1). However, in the case of the fingers, the function is preserved because the tendons, joints, and ligaments are usually preserved.<sup>2</sup>

These lesions can occur anywhere on the body; however, the extremities represent the most frequent anatomical site. Digital degloving injuries represent a challenge for the hand surgeon, while other regions can be treated with local, free flaps and grafts; in fingers, better results have been seen with reimplantation or revascularization. In cases that present distal devascularization, limb's vitality

depends on circulation restoration. However, in most of these injuries, it is challenging to locate the distal ends of vessels due to trauma mechanism/they are severely injured, making it hard to locate and reattach them.<sup>3,4</sup>



**Figure 1: Digital degloving injury.**

The body's inability to replace the skin and the need for functional recovery make this type of injury challenging for the plastic surgeon.<sup>4</sup> This study aims to present the management of two cases of digital degloving using a random pattern sub clavicular flap to provide skin coverage to the affected finger.

## CASE REPORT

### Case 1

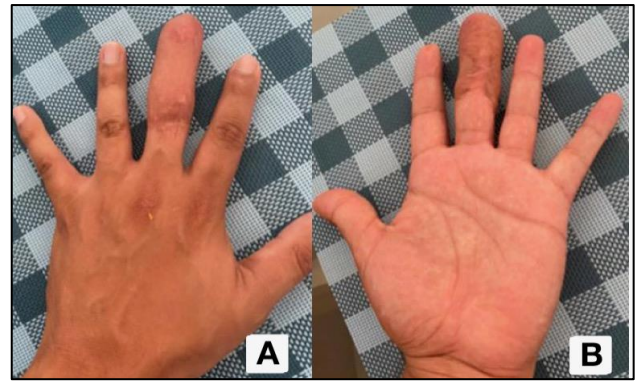
A 26-year-old male with blunt trauma to the left hand with an industrial machine roller of 6 hours of evolution presented degloving of the third finger, involving skin and subcutaneous tissue from the proximal phalanx, maintaining integrity of extensor, flexor, and tendinous system without osteoarticular damage (Figure 2 A).

It was decided to perform a random pattern tubular sub-clavicular flap to provide skin coverage to the affected finger (Figure 2 B). Fourteen days after the surgery; the flap base clamping sessions were started three times every 48 hours to retard the flap to promote its irrigation (Figure 2 C). The flap was released after 21 days. The donor area of the flap was closed directly (Figure 2 D).

During the postoperative course, He presented a small skin flap ischemia area next to the suture line, for which two weeks later, a partial thickness graft was placed from the ulnar edge of the hand with adequate integration. Rehabilitation with occupational therapy of the hand and finger started with good evolution. Eight months later, thinning of the flap and resection of the graft scar was performed, obtaining a decrease in the length and thickness of the finger, and six months later, after the last intervention, the last photographic record of the patient was obtained (Figures 3 A and B).



**Figure 2 (A-E): Clinical case 1 digital degloving of the third left finger, flap layout, sub-clavicular flap coverage flap delay and flap release.**



**Figure 3 (A and B): Eight months after procedure.**

### Case 2

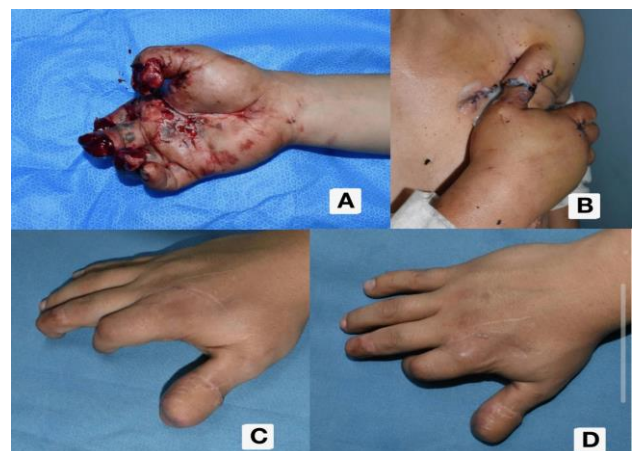
A 24-year-old male presents with blunt trauma to right hand after an explosion of a homemade explosive after 6 hours of evolution. The degloving injury involves skin, subcutaneous tissue, and bone of distal phalanges in 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> fingers. Adjacent soft tissues presented maceration and superficial 2<sup>nd</sup>-degree burns (Figure 4 A).

A sub-clavicular flap was made to provide skin coverage and maintain the length of the first right finger, partially closing the donor area of the flap (Figure 4 B). A crossed flap was made on the second finger using the back of the third finger as the donor area.

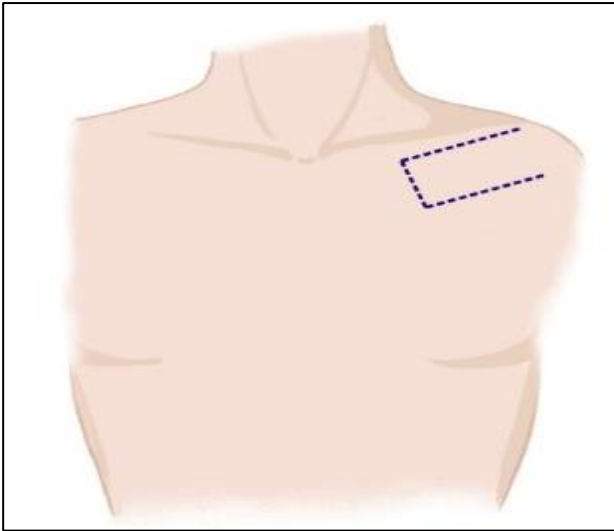
Two weeks after the described procedure, the flap base clamping sessions were started to perform the delay to improve flap blood flow.

After three weeks, both flaps were released, the sub-clavicular flap and the crossed finger flap.

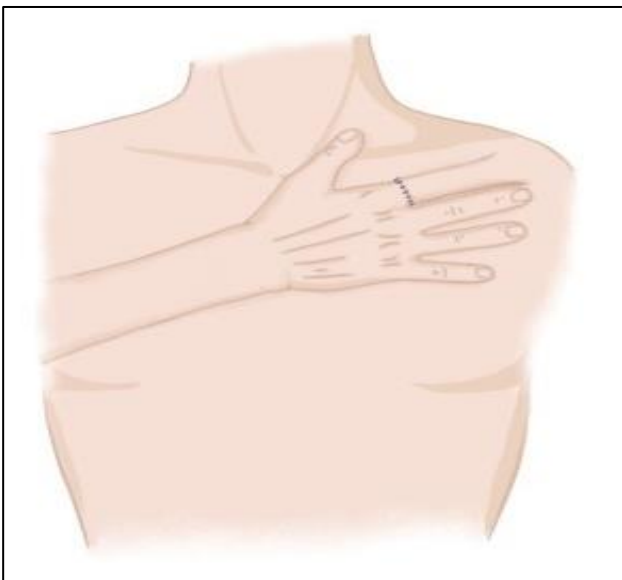
Figures 4 C and D show the result ten months after the reconstruction, presenting a thumb with adequate length for clamping and opposition without skin defects on the rest of the hand.



**Figure 4 (A-D): Clinical case 2, sub-clavicular flap on the first right finger and 10 months after procedure.**



**Figure 5: Flap layout.**



**Figure 6: Subclavicular flap.**

## DISCUSSION

Hand injuries have a high prevalence worldwide. In Mexico, they represent 26.9% of occupational accidents, reporting around 110,000 cases a year.<sup>5</sup> The general hospital “Dr. Manuel Gea González” is considered a reference center for this type of injury. Telich-Tarriba et al reported 4751 patients treated for trauma in the upper limb over five years.<sup>5</sup> From March 2022 to April 2023, 2,535 emergencies were attended, of which 1,018 involved some digital injury. Injuries due to degloving were only reported in 2 patients during said time.

Unfortunately, our country has no adequate record of injuries in the upper extremity, particularly in the digits. Therefore, the disabling sequelae are often unnoticed, mainly when integral management, including rehabilitation, is not received, and generates a

considerable increase in direct and indirect costs for the worker, the company, and society.

In this type of lesion, the first step in the approach is to identify the viable tissue. Once this step is complete, it is necessary to provide skin coverage to the exposed surface. For this, there are different therapeutic options. Karthikeyan et al proposes reimplantation or revascularization as the first line, particularly in those cases where the skin continues to adhere to the finger but has mostly been detached. However, in many situations, this option is not viable due to the vascular damage generated by the mechanism of injury, leaving as a therapeutic option taking the detached skin and using it as a full-thickness graft or taking skin from another site and performing a partial-thickness graft with high failure rates. Revascularization or reimplantation requires a team trained in microsurgery and adequate infrastructure, which is not often available.<sup>1,2</sup> Maruccia et al propose using an acellular dermal matrix placed under local anesthesia and providing coverage without requiring a donor site. However, there are few cases with excellent results, and in the vast majority, a graft is required to achieve full coverage of the lesions, which increases costs.<sup>6</sup> Another reconstructive resource in these cases is the use of flaps; the most frequently used are inguinal, abdominal, and free vascularized flaps.<sup>2</sup>

In our hospital, especially regarding the first finger, the method of choice in managing digital degloving injuries is the inguinal flap, also known as the McGregor flap. This procedure provides adequate skin coverage; however, it entails a series of disadvantages: it is a 2-stage procedure, there is a need for general anesthesia and hospital stay, increasing the infection rate, higher morbidity, and more days of immobilization in an uncomfortable position for the elbow and shoulder joint. In addition, it carries a disadvantage regarding the long-term mobility of the finger because it is a very thick flap.

The flaps obtained from the sub-clavicular area are mainly used to cover defects in the face and neck; however, it also provides skin coverage in partial and total loss of skin on the fingers.<sup>7</sup> This region's mobile, thin, hairless skin, which glides effortlessly over the underlying planes, makes it suitable for this procedure. In addition, it has sufficient circulation for this purpose, which is integrated by the superior intercostal arteries, branches of the subclavian, as well as perforating branches of the internal mammary, corresponding to the same arterial trunk, and of the axillary the acromiothoracic.<sup>8</sup>

The procedure to perform this flap is similar to any other random pattern. It begins with the layout of the flap (Figure 5), following the direction of the clavicle in parallel, slightly oblique to the transverse plane with its base in the deltoid groove, which should be the same width as the circumference of the affected finger. The base-length ratio should not exceed 4:1. Direct closure of



the defect created with separated stitches is performed. If there is difficulty in approximating the skin, the subcutaneous dissection of the flaps will be carried out previously. Progressively the tube is made, which will have the diameter of the finger to be repaired. The flap is placed in the corresponding finger defect site and sutured with separate 4 to 5 zero nylon simple stitches (Figure 6), a sling is placed to facilitate immobilization of the flap, and mobilization of the shoulder and unaffected digits is indicated every 8 hours to avoid arthrodesis of the joints. At 14 days, the flap was delayed using a Penrose to ligate the pedicle for 20 minutes, performing it three times every 48 hours. At 21 days, the flap is separated, resulting in an adequate skin cover, sending the patient immediately to rehabilitation.<sup>8</sup>

One of the advantages of the previously described flap is the possibility of performing it under local anesthesia in an ambulatory surgical unit, reducing the days of hospital stay, the cost of the procedure, and its morbidity. In addition, the learning curve for the surgeon is much lower than for more complex flaps, such as those usually used in these cases. The main disadvantage we identified is the visibility of the scar at the donor site.

## CONCLUSION

Finger degloving injuries represent a challenge for the hand surgeon due to the damage generated to the cutaneous vasculature and, in many situations, the inability to revascularize the detached tissue. There is a wide variety of flaps that provide skin coverage. In the case of the sub-clavicular random pattern flap, it was possible to preserve adequate digital function without significant morbidity through an outpatient procedure. This flap is a valuable tool for the plastic surgeon, providing good results through a simple and reproducible procedure in finger degloving injuries.

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