

# THE PEDICLED GROIN FLAP IN RESURFACING HAND BURN SCAR RELEASE AND OTHER INJURIES: A FIVE-CASE SERIES REPORT AND REVIEW OF THE LITERATURE

## LE LAMBEAU INGUINAL PÉDICULÉ DANS LA RECONSTRUCTION DES LIBÉRATIONS DE CICATRICES DE BRÛLURE ET AUTRES LÉSIONS DE LA MAIN: SÉRIE DE CINQ CAS ET REVUE DE LA LITTÉRATURE

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**SUMMARY.** In many settings, microsurgery is not yet common practice for hand injuries. In settings where it is current practice, the patient's health condition can sometimes be a contraindication. In this case, the pedicled groin flap may be a reliable option for hand surgeons. Information was retrieved from the medical charts of five patients treated with a pedicled groin flap at our National Centre for Burn, Plastic and Reconstructive Surgery between 1st January 2013 and 1st July 2015. We documented socio-demographic features, defect characteristics (aetiology, size), post-operative complications, outcome, and patient satisfaction with cosmetic appearance and donor site scar. There were two cases of burn scar release, two cases of traumatic hand injury, and one case of squamous cell carcinoma excision. There was one distal ischemia of the flap and one flap requiring secondary thinning. All the patients were very satisfied with the donor site scar, which was easily hidden in underwear. Four patients were very satisfied with the reconstructed hand. Despite the current trend towards free tissue transfer, the pedicled groin flap continues to be regarded as a safe, easy and reliable option for the reconstruction of soft tissue defects, and remains widely used.

**Keywords:** hand, groin flap, traumatic hand injury, ring finger, hand burn, microsurgery

**RÉSUMÉ.** Dans beaucoup de milieux, la microchirurgie n'est pas encore de pratique courante pour la couverture des lésions de la main. Dans les endroits où la microchirurgie est possible, l'état du patient peut en constituer une contre indication. Dans ces cas, le lambeau inguinal pédiculé est une solution fiable pour les chirurgiens de la main. Les informations ont été tirées des dossiers médicaux de cinq patients traités avec le lambeau inguinal pédiculé au Centre National des Brûlés et Chirurgie Plastique et Reconstructrice dans la période du 1er janvier 2013 au 1er juillet 2015. Nous avons analysé les paramètres socio-démographiques, les caractéristiques du défaut (étiologie, mesures), les complications post opératoires, l'évolution, et la satisfaction des patients par rapport à l'aspect cosmétique et par rapport à la cicatrice du site donneur. Il y a avait deux cas de libération de cicatrices de brûlure, deux cas de traumatisme de la main, et un cas d'excision de carcinome basocellulaire. Nous avons observé une ischémie distale d'un lambeau et un lambeau nécessitant une chirurgie secondaire de dégraissage. Tous les patients étaient très satisfaits par la cicatrice du site donneur facilement dissimulable dans les sous-vêtements. Quatre patients étaient très satisfaits par la main reconstruite. Malgré l'évolution actuelle vers l'utilisation des transferts tissulaires libres, le lambeau inguinal pédiculé continue d'être perçu comme sûr, facile et fiable pour la reconstruction des défauts des parties molles de la main, et demeure largement utilisé.

**Mots-clés:** main, lambeau inguinal, lésion de la main, doigt d'alliance, brûlure de main, microchirurgie

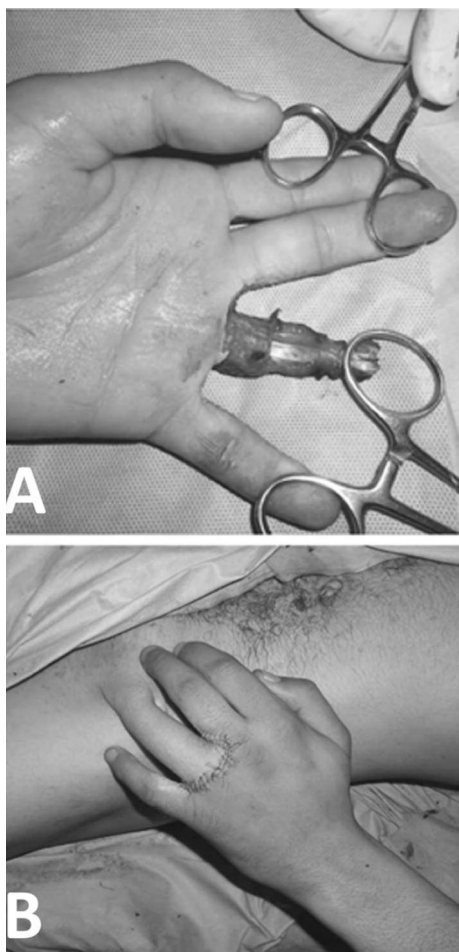
### Introduction

Tissue loss in hands is common and the result of many aetiologies, including acute burns, burn scar release, trauma and tumour excision, in conditions that may lead to important functional impairment, especially when tendons, nerves or vessels are exposed or involved in the initial lesion. Microsurgery has taken on an important role in the reconstructive arsenal from many perspectives. Two situations can be encountered. First, in many centres around the world, especially in low- and mid-

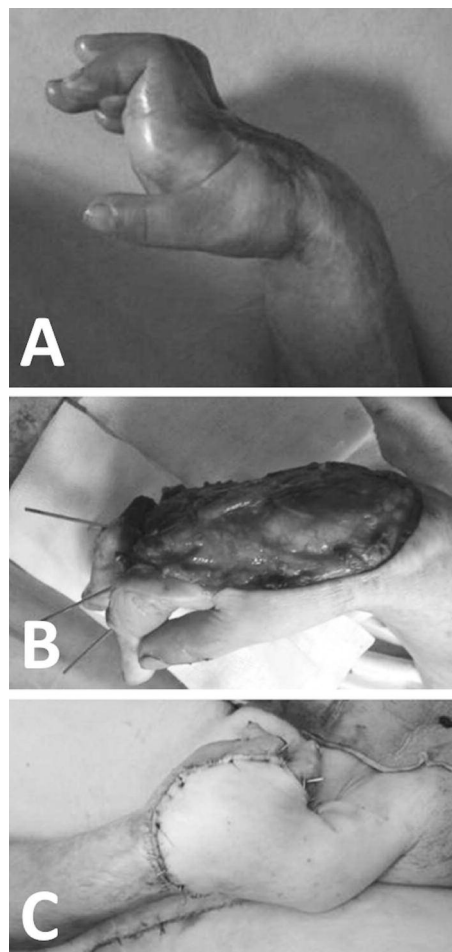
dle-income countries, microsurgery is not common practice due to the surgical team's lack of experience and training, and the unavailability of microsurgical equipment. Secondly, in equipped settings and centres where microsurgery is common practice, the patient's condition can sometimes be a contraindication for microsurgery. In both situations, a pedicled flap may be the only option for the hand surgical team. The pedicled groin flap described by McGregor and Jackson in 1972<sup>1</sup> is one surgical possibility that still has many indications in hand resurfacing. It has been shown to be reliable and it has

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**Fig. 1**  
(A) Ring finger with extensor repair;  
(B) Coverage of the ring finger with a pedicled groin flap.



**Fig. 2**  
(A) Post burn contracture of a hand;  
(B) Release and splinting of metacarpophalangeal joints with Kirshner spines;  
(C) Coverage of the defect on the dorsum of the hand with a pedicled groin flap.

minimal peri-operative complications, which make it the procedure of choice in many centres around the world.

This study describes our experience using the pedicled groin flap for burn scar release, traumatic hand injury and for a defect following hand squamous cell carcinoma excision. We analysed the weaknesses and strengths of the procedure through a comparison of our cases with data in the literature.

### Patients and method

We retrospectively retrieved information from the medical charts of five patients treated with a pedicled groin flap between 1st January 2013 and 1st July 2015 at the National Burn Centre, Plastic and Reconstructive Surgery, Casablanca, Morocco.

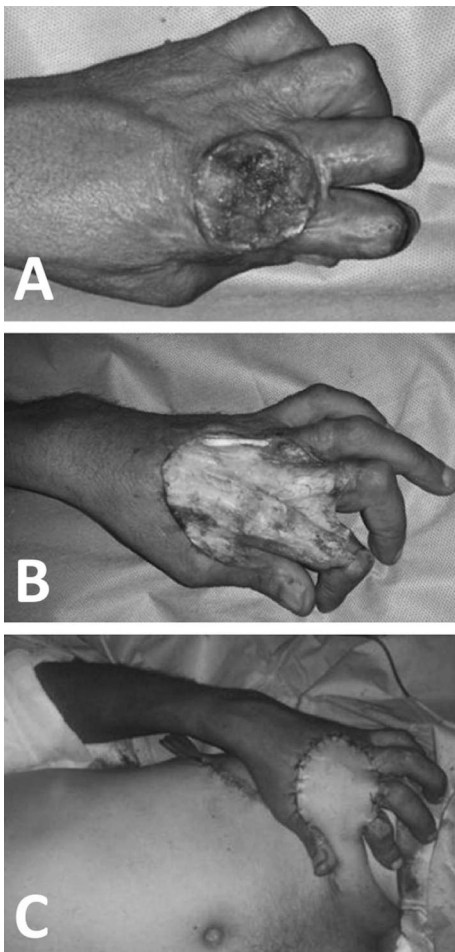
We documented socio-demographic features, aetiology and size (length over weight in centimetres) of defects, post-operative complications, outcome, patient satisfaction with cosmetic appearance and donor site scar (not satisfied, satisfied, very satisfied).

#### Operative technique

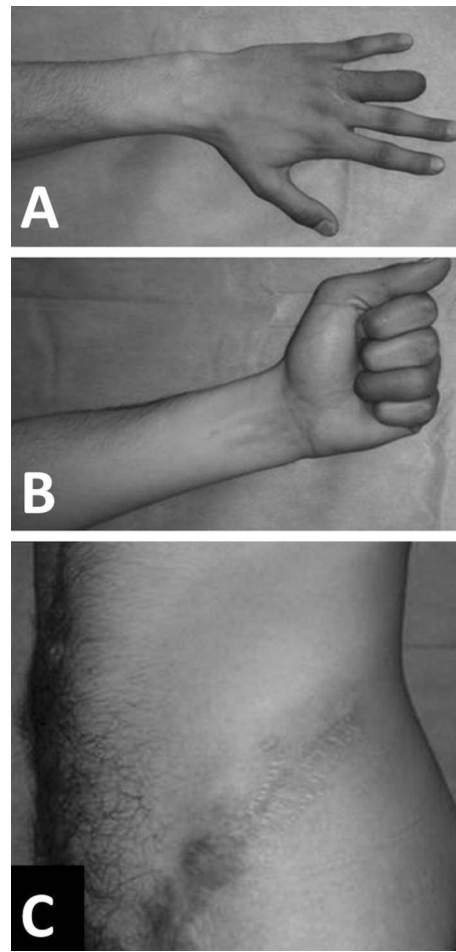
Patients signed a consent form after receiving explanations about the procedure, necessary immobilisation, the different steps, possible post-operative complications and expected results.

Patients lay in a supine position with a block under the ipsilateral buttock. General anaesthesia and tracheal intubation were required. Defects were measured and a pattern drawn

out. The pubic tubercle and anterior superior iliac spine (ASIS) were marked. A line drawn between these two marks represented the inguinal ligament. The axis of the femoral system, identified by palpation, was the medial border of the flap. A point at approximately 2.5 cm below the inguinal ligament on the axis of the femoral system was the theoretical origin of the superficial circumflex iliac artery (SCIA) that supplied the flap. The axis of the flap was a line from this point to the ASIS. The lateral border of the flap was the ASIS. When a wider coverage was needed, the flap overlapped the ASIS with a width of 1/1 without including the femoral lateral nerve. The pattern of the defect was reported onto the flap, one third of the width below the axis and two thirds above. Dissection was carried out from lateral to medial up to deep aponeurosis. Medially at the level of the sartorius muscle, dissection was performed deeper to protect the SCIA system. The femoro-cutaneous nerve was always preserved during dissection, which continued to the origin of the SCIA when necessary. Immediate debulking was performed, removing the fat below the superficialis fascia in fatty patients. The donor site was closed with direct suture after wound edge undermining and drainage. The flap was fixed tightly to the hand defect with edge-to-edge non-absorbable sutures. The remaining medial part of the flap was tubed with a continuous non-absorbable suture. The forearm was bandaged to the trunk for the first week. Conventional dressings were changed every three days or later if no exudate appeared. Division of the flap was done after the pedicle was ligated at three weeks after the operation.



**Fig. 3**  
 (A) Squamous cell carcinoma on the dorsum of the hand;  
 (B) Post excision defect is 8cm x 6cm;  
 (C) Immediate coverage with a pedicled groin flap.



**Fig. 4**  
 Outcome at two-year follow-up.  
 (A) Reconstructed finger;  
 (B) Donor site scar.

**Results**

Five patients (three men and two women) aged between 18 and 55 years old were included in this study. Aetiologies were:

- traumatic hand injury in two patients (one following a road traffic accident and the other a ring finger injury in a sports accident) (*Fig. 1*);
- post-burn hand scar excision in two patients (*Fig. 2*);
- squamous cell carcinoma excision in one patient (*Fig. 3*).

Tendon and bones were most exposed or involved in the injury.

There was a superficial distal ischemia of the flap in one patient at pedicle ligation. Pedicle division was delayed for one more week, and then the procedure was successfully completed. There was no case of infection and no concerns about thigh sensibility.

Functional and aesthetic outcome was good in all patients (useful, good-looking hand). The skin on the reconstructed hand was pliable and had a good colour (*Fig. 4*). Lack of sensibility was our main concern. Upper limb joint stiffness was observed in all patients. This resolved after a few weeks.

All the patients were very satisfied with the donor site scar. Four patients judged their flap to be good and were very satisfied. One patient found the flap too thick. Secondary thinning was performed at four months, and the patient was satisfied with the final result. *Table I* provides a summary of information on all five patients.

**Discussion**

The groin flap is an axial-patterned cutaneous flap based on the superficial circumflex iliac arteriovenous system. This

**Table I** - Clinical, therapeutic and outcome characteristics of the patients

| Sex | Age (years) | Etiology                         | Surface of the hand defect (cm x cm) | Structures exposed        | Post operative complications | Secondary thinning surgery | Satisfaction regarding the flap | Satisfaction regarding donor site scar | Follow up, months |
|-----|-------------|----------------------------------|--------------------------------------|---------------------------|------------------------------|----------------------------|---------------------------------|--|-------------------|
| M   | 18          | Ring finger                      | 7 x 6                                | Tendon and bones          | None                         | No                         | Very satisfied                  | Very satisfied                         | 24                |
| F   | 38          | Sequels of road traffic accident | 15 x 12                              | Tendons                   | Distal necrosis              | Yes                        | Satisfied                       | Satisfied                              | 12                |
| M   | 58          | Squamous cell carcinoma          | 8 x 6                                | Metacarpophalangeal joint | None                         | No                         | Very satisfied                  | Very satisfied                         | 9                 |
| M   | 28          | Burn sequels                     | 10 x 7                               | Tendons                   | None                         | No                         | Satisfied                       | Very satisfied                         | 12                |
| F   | 32          | Burn sequels                     | 8 x 6                                | Tendons                   | None                         | No                         | Satisfied                       | Satisfied                              | 8                 |

flap can provide soft-tissue coverage for defects on any part of the hand and the distal two thirds of the forearm.<sup>2</sup> The flap can be designed as a bilobed double-leaf (Y) pattern or other shapes to fit specific defects.<sup>3-7</sup> An extended groin flap has also been described that includes the lateral femoral cutaneous nerve (LFCN) that must be sacrificed. Circulation to the extended portion is maintained by the communicating branches between the lateral femoral cutaneous artery (LFCA) and the SCIA.<sup>8</sup>

Since they were first described, groin flaps have been the most widely used pedicled flaps in hand reconstruction.<sup>9-11</sup> They can cover extensive defects of over 10x15cm without sacrificing a major artery or the need for end-to-end microvascular anastomosis.

The following advantages explain their wide use:

- vascular reliability even when anatomic variations exist;<sup>6,11,12</sup>
- good vascular supply that enhances the viability of surrounding tissue near the flap;<sup>11</sup>
- simple procedure that can be carried out by less experienced surgeons, and short operative time;<sup>3</sup>
- secondary division and inset procedures can be performed in a short outpatient procedure;<sup>3</sup>
- it can be used in emergency cases because of the quickness of the procedure and the large surface of the flap;<sup>9,12,13</sup>
- tubed pedicle allows early wrist physiotherapy, which is not possible when using other distant flaps such as the abdominal wall flap graft that may have similar indications;<sup>11,14-16</sup>
- good quality, hairless skin, with a good cosmetic appearance;<sup>12</sup>
- acceptable donor site scar, easily hidden by underwear;<sup>8,11,12</sup>
- the groin flap donor site also provides full access to the iliac crest for bone graft harvest when required without creating another scar.<sup>3</sup>

Contraindications are anatomical malformations, previous groin surgery, cancer or radiotherapy in the groin area.<sup>17</sup> No patient in our study presented contraindications. The major drawback of the groin flap in our practice and reported in the literature is upper limb joint stiffness. Restriction in shoulder mobility has been described as the most aggravating complication.<sup>18</sup> However young patients under 50 years of age are less likely to suffer from postoperative shoulder stiffness. The risk increases with age.<sup>18</sup> For this reason, extreme age (children and patients over 55 years old) is a contraindication for the pedicled groin flap. Nevertheless, Buchman et al published cases of four patients aged between 59 and 79 years old with good results, and showed that the flap is feasible in elderly patients when physiotherapy is started early.<sup>19</sup>

Disadvantages of pedicled groin flaps have been discussed in various recent reports. The flaps are usually bulky, require multiple stages, necessitate longer hospital stay, cause patient discomfort, stiffness, and do not allow elevation of the hand after acute trauma. Moreover, primary reconstruction of composite defects can not be done.<sup>16,20</sup> Nevertheless, authors have

stressed that pedicled groin flaps may still be indicated in the current era of microsurgery. The indications are as follows: complex defects in children under two years old; coverage of digit stump defects in preparation for toe-to-hand transfer; high-voltage electric burns with the hand surviving on collateral blood supply; salvage of the thumb ray in high-voltage electric burns with concurrent thrombosis of the radial artery; mutilating hand injuries; length preservation of multiple digit amputations in manual workers; and multiple defects within the digits, hand or forearm.<sup>16</sup>

Despite the inherent advantages of free flaps for soft tissue coverage in upper limb reconstruction, pedicled groin flaps remain the workhorse in many centres worldwide. Refinements in technique during planning can offset many of their inherent disadvantages.<sup>20</sup> These disadvantages can be greatly reduced by proper planning to orient the flap towards the defect, thus avoiding any kinking at the base, and increasing inset with ease. Proper planning avoids a lengthy flap and tubing, increases the patient's comfort, and makes division and inset of the flap easier.<sup>2</sup>

Multiple pedicled flaps may be combined to reconstruct extensive and complex hand defects.<sup>3,21</sup> A case of degloving injury of the whole hand reconstructed with a combination of an anterolateral thigh (ALT) flap and a groin flap applied as a pedicled distant flap has been reported. Despite complications of congestion of the ALT flap and superficial infection, both flaps were severed at four weeks after transplantation, and a useful hand was finally reconstructed.<sup>21</sup> Reconstruction of a hand blast injury resulting in large through-and-through composite tissue loss by soft tissue coverage of both dorsal and palmar wounds using two separate pedicled flaps with pedicles closely arising from the femoral artery (a superficial inferior epigastric artery (SIEA) flap and a groin flap) has been also reported.<sup>3</sup> The combined use of a groin flap and a pedicled Scarpa's flap (SIEA) for circumferential finger burn defects and a groin flap combined with tensor fascia lata myocutaneous flap to cover a completely degloved hand have also been described.<sup>22,23</sup> Such combinations of pedicled flaps may not be optimal but must be considered an available procedure for covering large skin defects without microsurgical procedures.<sup>21</sup> The major advantage of pedicled flaps is that they are quick and easy to raise and do not need any special microsurgical expertise. Where free flaps are not possible or when they fail, pedicled flaps are the lifeboat. An upper limb reconstructive surgeon must be adept at performing these flaps in challenging situations.<sup>20</sup>

## Conclusion

Despite the current trend towards free tissue transfer flaps that provide excellent coverage for hand defects, the long operating time with increased risk of perioperative morbidity as well as the need for special equipment and well-trained surgical teams makes it unattractive and difficult in many centres. The pedicled groin flap has long been accepted as a safe, easy and reliable option for the reconstruction of soft tissue defects, and remains widely used.

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