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Use of ulnar vascular reverse skin flap in hand defects. A report of two cases.

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Abstract

Introduction: The primary goal in musculocutaneous injuries is to achieve effective anatomical repair and coverage. For the management of skin defects in the hand with exposed tendons, bone, or nerves, the ulnar vascular reverse skin flap is a reliable and versatile reconstructive option, as it provides the thin, flexible, and well-vascularized tissue these conditions require. The aim of this study is to evaluate the effectiveness and final outcomes of hand skin coverage using the ulnar flap.

Materials and methods: descriptive, retrospective study in patients treated for loss of skin coverage of the hand on the medial and anteromedial border of the little finger, in the Traumatology service of the Alcívar Hospital, period 2023 – 2025.

Case report: Two male patients were treated with a reverse ulnar vascular skin flap. The Likert scale was used to assess postoperative satisfaction, yielding a high level of satisfaction.

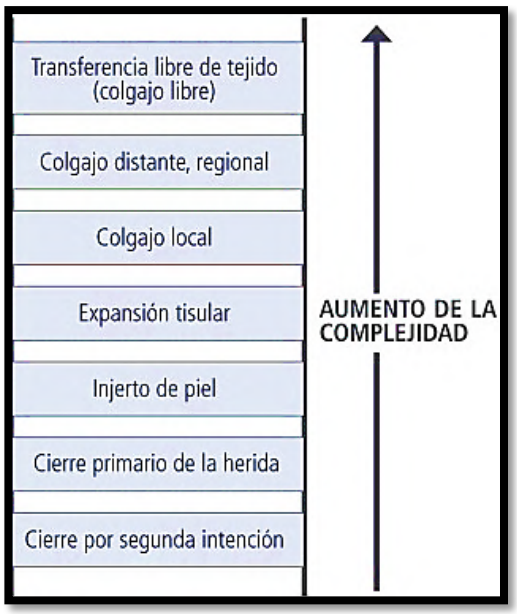
Conclusions: The ulnar vascular reverse skin flap is a versatile and reliable option for hand defect reconstruction, especially on the medial and anteromedial border of the little finger, providing high-quality coverage without compromising the main vascularization of the limb.

Keywords: Orthoplasty, Ulnar flap, Skin defects, Surgical techniques.

Introduction

Orthoplasty, described in 1993 by L. Scott Levin, MD, FACS, emphasizes immediate multidisciplinary collaboration among orthopedic surgeons in the management of traumatic extremity injuries. It describes a reconstructive ladder that includes secondary intention closure, primary closure, skin grafting, tissue expansion, local flap, distant or regional flap, or free flap; in many cases, more than one step may be employed (Figure 1). The main advantages of an orthoplastic approach include reduced time to soft-tissue coverage, decreased risk of infection, and improved functional outcomes [1-3].

Figure 1. The ladder of reconstruction [1].



In 1981, Mathes and Nahai described a classification of musculocutaneous flaps based on their vascular anatomy, and free perforator flaps were described in 1990 [4]. The history of orthoplastic surgery has undergone significant evolution in recent years, driving the optimization of reconstructive techniques based on experience and progressive knowledge of anatomy.

A flap can be defined as a segment of vascularized tissue that is transferred from a donor site to an adjacent or distant area. It may maintain its vascular connection to the site of origin, as in local flaps, or the vascular connection may be interrupted and then restored using microsurgical techniques in the recipient area, as in the case of free flaps [5]. It differs from a graft, which obtains its blood supply from the revascularization of the recipient site; in contrast, a flap has its own blood supply [6]. The criteria for selecting flaps for limb reconstruction are based on the wound surface area, the type of tissue deficiency, the pedicle length, the volume of deficient tissue, and the morbidity of the donor site [7]. The choice of coverage technique depends on the location and extent of the defect [8].

The challenge for the orthopedic surgeon is repairing musculocutaneous injuries, as these areas have little adipose tissue, multiple tendons, low muscle volume, several bony structures, and inelastic skin [8, 9]. In 1985, Becker and Gilbert [10] first described the ulnar flap as a pedicled flap of the dorsal branch of the ulnar artery for small defects on the dorsum and

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palm of the hand; subsequently, Bertelli described it as a neurocutaneous flap in 1992 [11]. It is used for soft tissue coverage of the hand, especially the palm, dorsum, and fingers, when thin, flexible, and well-vascularized tissue is required without sacrificing the major vascular axes of the forearm or hand [12, 13].

It is a versatile flap that can be used as a pedicled flap [14], with the ascending branch of the dorsoulnar artery; as an island flap; and as a retrograde flow flap, with the descending branch of the dorsoulnar artery and its anastomosis with a deep branch of the ulnar artery on the back of the hand. Initially, its disadvantage was that it was designed to cover small areas, but Antonopoulos et al. demonstrated that it can cover defects 20 cm long by 9 cm wide [15].

The main advantages are that it provides a thin, flexible tissue, allows moderate- to large-sized coverages, maintains the integrity of the major vessels of the forearm, and allows sensory recovery [16].

The aim of this study is to demonstrate our experience with the final results of the ulnar vascular flap in the surgical repair of skin defects of the extremities, as well as to measure the degree of postoperative satisfaction using the Likert scale. This study included patients who attended the traumatology department of Hospital Alcívar for traumatic orthopedic conditions during the period 2023-2025.

Case report

Studio design

A retrospective, cross-sectional, descriptive, observational study was conducted on two patients with hand skin loss treated between 2023 and 2025 at Alcívar Hospital. The loss was resolved with a reverse cubital flap. Parameters such as age, sex, cause, location, and lesion size were recorded. Information from the medical records of patients with skin loss was analyzed. To measure outcomes related to functional capacity and pain, a 5-point Likert scale was used (1 = not at all satisfied, 2 = somewhat satisfied, 3 = neutral, 4 = very satisfied, 5 = completely satisfied). The Quick DASH (Disabilities of the Arm, Shoulder and Hand) scale consists of 11 questions that the patient must answer, evaluating their ability to perform certain activities and the presence of symptoms during the past week. Responses are scored from 0 to 5, where 0 indicates no difficulty and 5 indicates that they cannot perform their activities. The following procedures were performed on these patients:

Preoperative evaluation: The skin defect was measured beforehand

Flap design: The flap was designed on the volar-medial aspect of the distal third of the forearm, taking as an anatomical basis the axis of the ulnar artery and the location of the perforator.

Dissection: A subfascial dissection was performed, starting distally, preserving the ulnar perforator and respecting the accompanying vessels. The flap included skin, subcutaneous tissue, and fascia.

Rotation and placement: The flap was rotated on its pedicle through an arc of 120° to 180°, depending on the location of the defect, and then placed at the recipient site.

Closure: The donor site was closed primarily when possible, or by partial skin grafting. Penrose drains were used according to surgical criteria.

Case 1

A 35-year-old male patient, while working on a raid operation, suffered a wound to the palmar surface of the fifth finger of his left hand, with loss of skin coverage (Figure 2). The size of the

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lesion is 3 x 2 cm. The Quick DASH score was 2.3%. The Likert scale result was 4, indicating "very satisfied".

Figure 2. Graphical report of the evolution of case 1.

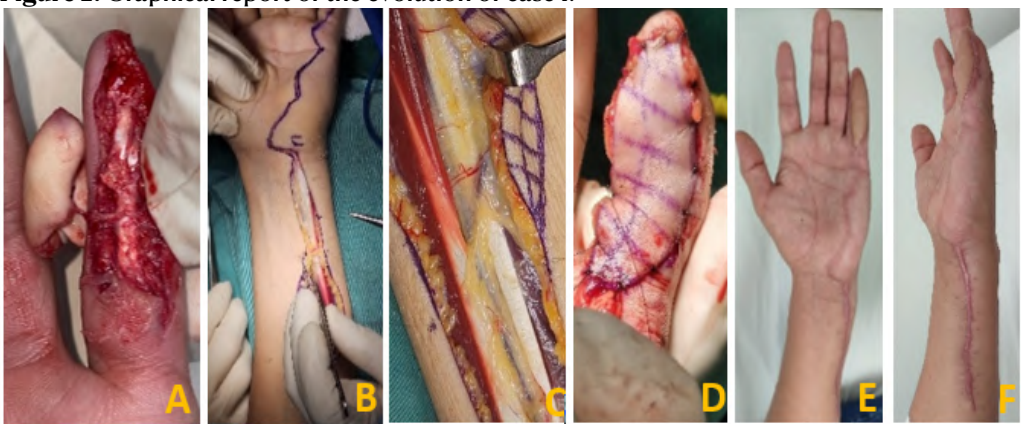

Figure 2: A) Medial skin loss on the little finger of approximately 3 x 2 cm. B) Delineation of the surgical area for the Becker flap. C) Descending branch of the dorsoulnar artery. D) Coverage with Becker flap. E) F) Assessment at 3 months post-surgery with a Likert scale of 4 (very satisfied).

Case 2

A 56-year-old male patient, while descending stairs, lost his balance on a wet floor, suffering traumatic amputation of the fifth finger and degloving of the fourth finger (Figure 3). The size of the injury is 5 x 2 cm. The Quick DASH score was 4.5%. The Likert scale result was 5 - completely satisfied.

Figure 3. Graphical report of the evolution of case 2.

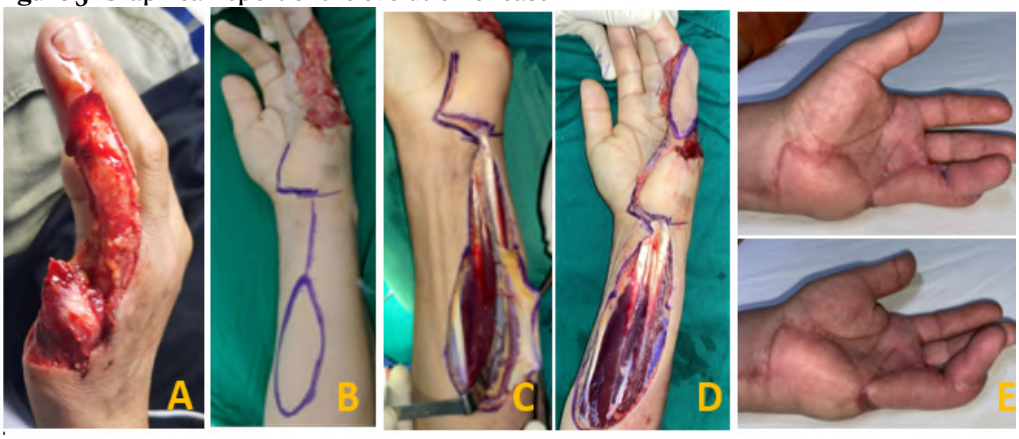

Figure 3: A) Traumatic amputation of the fifth finger and degloving of the fourth finger, approximately 5 x 2 cm. B) Delineation of the surgical area for the Becker flap. C) Descending branch of the dorsoulnar artery. D) Coverage with Becker flap. E) Assessment at 2 months post-surgery with a Likert scale score of 5 (fully satisfied).

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Discussion

Orthopedic surgeons frequently encounter situations that require coverage of soft-tissue defects of the extremities. Such coverage must be performed as effectively as possible. Following timely infection control of the lesion and subsequent surgical debridement of devitalized tissue, a clean, vascularized wound is obtained—that is, a wound with granulation tissue, reduced local edema, and neoepithelialization at the wound edge. One of the options offered by the reconstructive ladder is then chosen [17-21].

With a multidisciplinary assessment to optimize recovery, rapid, individualized decisions can be made across a wide range of skin lesions. The orthoplastic approach reduces complications and improves functional outcomes, thereby enhancing patients' quality of life in the short and long term [22, 23].

The selection of the surgical technique according to the skin defect, regardless of the reconstruction, is of vital importance: immobilizing the wound on a mobile or synovial joint and relieving it prevents external forces from interrupting the healing process [10].

The first option for covering exposed bone, tendon, nerve, or blood vessel areas is a local or regional flap that uses muscle or the skin surface. This type of flap can be used for small- to medium-sized defects and when blood flow to the recipient site is intact, thereby preventing total necrosis of the tissue covering the skin defect [21].

A flap transfer is ideal when there is significant soft tissue loss in the limb, with bone, tendon, or osteosynthesis elements exposed, which, in many cases, avoids limb amputation [9], partly to preserve exposed bone, reduce infection rates, and promote early healing [22].

The reverse ulnar vascular skin flap (Becker) is a reliable and versatile reconstructive option for managing hand defects, particularly in cases of tendon, bone, and nerve exposure, where coverage with thin, flexible, and well-vascularized tissue is required. Several studies have demonstrated that this flap allows coverage of thin, flexible, and well-vascularized tissues, with satisfactory functional and aesthetic results [. In the pediatric context, the dorsal ulnar artery neurocutaneous flap has shown favorable long-term results, allowing for functional development of the hand [12, 18]. In adults, clinical experience with the reverse dorsoulnar flap has reported a 100% success rate in covering both palmar and dorsal defects, with minimal donor-site complications and good functional and aesthetic results [19]. In our two patients, neither experienced complications.

Several studies have demonstrated high viability rates. For example, Huang et al. (2013) reported a 100% survival rate. % in a series of 36 patients, with minimal complications and adequate functional recovery. Similarly, Lee et al. (2021) [20] highlight its efficacy, even in pediatrics, documenting its successful use in post-burn reconstructions, with adequate flap growth and minimal functional restriction after follow-up, and relate this to the cases presented with favorable results.

Conclusion

The ulnar vascular reverse skin flap is a versatile and reliable option for the medial and anteromedial borders of the little and ring fingers, providing high-quality coverage without compromising the limb's main vascular supply. The Beker flap offers a high survival rate, vascular preservation, anatomical adaptability, and satisfactory functional outcomes.

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Abbreviations
None.

Supplementary information
Supplementary materials have not been declared.

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Authors' contributions
Manuel Enrique Betancourt Castillo : Conceptualization, data curation, research, methodology, visualization, original draft writing.
Hugo Ernesto Villarroel Rovere : Conceptualization, data curation, research, project management, and writing of the original draft.
All authors read and approved the final version of the manuscript.

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