

# Pedicated abdominal flap reconstruction for complex dorsal hand defect. A case report

Axell Daniel Lugo Rodríguez M.D.  
José de Jesús Zapata Rosales M.D.  
María de Jesús Valdéz Rivera M.D.  
Isabel Híjar Cabello M.D.  
José Martín Hinojosa Rodríguez M.D.  
Héctor Abraham Peralta Ruíz M.D.

Coahuila, Mexico

Case Report

Plastic Surgery



**Background:** Soft tissue defects of the dorsal hand with exposure of tendons and other vital structures represent a major reconstructive challenge. Although microsurgical free flaps are currently considered the preferred option for complex hand reconstruction, limited availability of specialized resources and surgical expertise may restrict their use in certain settings. In such circumstances, pedicled flaps continue to represent a reliable and effective alternative for soft tissue coverage. We present the case of a patient with a complex dorsal hand soft tissue defect managed using a pedicled abdominal flap. Following adequate debridement and wound preparation, reconstruction was performed with an abdominal flap to achieve stable coverage of the exposed structures and preserve hand function. The postoperative course was favorable, with adequate flap viability and satisfactory functional and aesthetic outcomes. Despite the advances in microsurgical reconstruction, abdominal flaps remain a valuable option in selected patients, particularly in resource-limited environments or when free tissue transfer is contraindicated. This technique provides durable coverage, technical simplicity, and acceptable functional results, maintaining its relevance in contemporary reconstructive hand surgery

**Keywords:** Pedicled flap, hand reconstruction.

Soft tissue defects of the dorsal hand with exposure of tendons, bones, or neurovascular structures represent a significant reconstructive challenge for hand surgeons. Adequate coverage is essential not only to preserve limb viability, but also to restore function, prevent infection, and achieve acceptable aesthetic outcomes. Over the past decades, advances in microsurgical techniques have established free flap reconstruction as the preferred method for managing complex hand and forearm defects due to its versatility and ability to provide durable tissue coverage.

Before the development and widespread availability of microsurgical reconstruction, pedicled abdominal and groin flaps were commonly used for upper extremity soft tissue coverage. Although these techniques are associated with certain disadvantages, including temporary immobilization, patient discomfort, joint stiffness, and the need for secondary flap division procedures, they continue to play an important role in selected clinical scenarios. In many institutions, particularly in resource-limited settings, the lack of microsurgical equipment, specialized training, or suitable recipient vessels may limit the feasibility of free tissue transfer.

Among the available reconstructive options, the pedicled abdominal flap remains a reliable and technically reproducible alternative for coverage of complex dorsal hand defects. This technique provides well-vascularized tissue, satisfactory durability, and acceptable functional outcomes while avoiding the

complexity associated with microsurgical procedures. We present the case of a patient with a complex dorsal hand soft tissue defect successfully reconstructed using a pedicled abdominal flap, highlighting the continued relevance of this technique in contemporary reconstructive surgery.

## Case report

A 45-year-old female patient with a significant past medical history of poorly controlled type 2 diabetes mellitus of 20 years' duration and poor adherence to medical treatment presented to the emergency department for evaluation of a severe dorsal hand infection. The patient reported sustaining trauma to the dorsal aspect of the hand caused by an unspecified object approximately three weeks prior to admission. Two days after the injury, she developed progressive swelling, increased local temperature, erythema, and pain in the affected area. The patient initially sought medical attention at her primary care clinic, where symptomatic treatment was prescribed, and she was discharged home. However, she experienced progressive clinical deterioration, characterized by purulent drainage from the wound, skin discoloration, and subsequent development of necrotic tissue (Figure 1).

Due to worsening symptoms, she presented to the emergency department for further evaluation. Upon assessment by the Plastic Surgery service, extensive soft tissue infection consistent with a

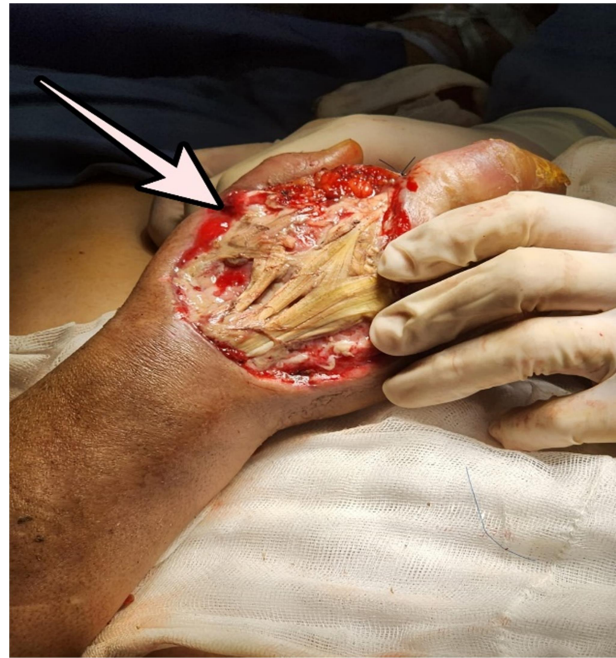


**Figure 1.** Right hand of the patient upon admission to the emergency department, demonstrating extensive dorsal soft tissue involvement characterized by necrotic eschar formation and areas of devitalized tissue, associated with active purulent exudate suggestive of ongoing infection.

diabetic hand infection was identified. The patient was taken urgently to the operating room for surgical debridement and irrigation. Approximately 250 cc of foul-smelling purulent material was drained. Escharectomy and extensive debridement of devitalized tissue were performed, revealing a significant soft tissue defect over the dorsal aspect of the hand following resection of necrotic tissue. The patient was admitted for inpatient management, including broad-spectrum antibiotic therapy, analgesia, and serial surgical debridements every 48 hours, for a total of six procedures. Once adequate infection control and wound bed preparation were achieved, negative pressure wound therapy was initiated, and the patient was subsequently discharged home with close outpatient follow-up.

During outpatient management, three additional negative pressure dressing changes were performed, ultimately achieving a negative wound culture and adequate granulation tissue formation (Figure 2).

Reconstructive surgery was subsequently planned using a pedicled abdominal flap for definitive soft tissue coverage (Figure 3). Daily postoperative monitoring demonstrated adequate flap perfusion without evidence of ischemia or necrosis. Three weeks later, flap division and final inset were successfully completed. During follow-up, the flap demonstrated complete integration with minimal complications and satisfactory functional and aesthetic outcomes. The patient achieved complete recovery of hand mobility and grip strength and was referred to the rehabilitation



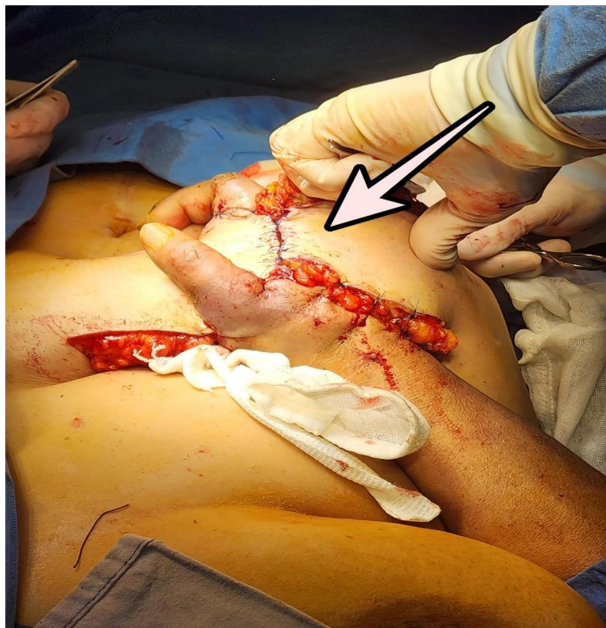
**Figure 2.** Surgical wound bed following removal of the negative pressure wound therapy system, demonstrating well-vascularized granulation tissue without clinical evidence of residual infection.

service to optimize functional recovery and hand movement.

### Discussion

Soft tissue defects in the hand and upper extremities that require durable coverage remain a complex reconstructive challenge because the underlying tendons, nerves, joints, and bones are frequently exposed, requiring stable and well-vascularized tissue coverage to preserve both function and limb viability (1,5). Reconstruction techniques may include skin grafts, local and regional flaps, distant pedicled flaps, and complex microsurgical free tissue transfers. The reconstructive method selected depends on several factors, including the size and location of the defect, the extent of contamination or infection, vascular integrity, patient comorbidities, surgeon experience, and institutional resources.

Although microsurgical free flaps are currently considered the gold standard in complex upper extremity reconstruction because they provide thin, pliable tissue with excellent functional outcomes, their use is often limited in daily clinical practice due to prolonged operative times, the requirement for specialized microsurgical training, lack of infrastructure, patient instability, and poor recipient vessels (1,4,5). In addition, patients with uncontrolled diabetes mellitus, peripheral vascular disease, extensive trauma, or severe infection may not be optimal candidates for microsurgical reconstruction because these conditions increase the risk of



**Figure 3.** Intraoperative view demonstrating placement of an abdominal flap over the surgical defect, with confirmation of adequate flap perfusion and viability.

thrombosis, flap failure, and wound complications (8,11). Under such circumstances, pedicled abdominal flaps continue to represent a safe and reliable reconstructive alternative.

Historically, abdominal and groin pedicled flaps were widely used before the development of microsurgical techniques and played a fundamental role in limb salvage and hand reconstruction (10). Although their popularity declined with the advancement of free tissue transfer, several authors have emphasized that these flaps still retain important indications in contemporary reconstructive surgery, particularly in severe crush injuries, electrical burns, extensive avulsion injuries, traumatic amputations, multiple digit defects, and complex infected wounds (1,12). In resource-limited settings, pedicled flaps remain especially valuable because they do not require microsurgical equipment or prolonged operative times while still providing reliable vascularized coverage.

Pedicled abdominal flaps are often criticized because of disadvantages such as patient discomfort, prolonged immobilization, flap bulkiness, temporary restriction of upper extremity movement, and the need for staged procedures with delayed flap division (1,4). Nevertheless, modern refinements in flap design, positioning, and postoperative management have significantly improved patient tolerance and surgical outcomes. Maintaining a narrow but adequately vascularized pedicle allows safer positioning of the upper extremity while minimizing tension and reducing the risk of distal ischemia (13). Furthermore, proper patient positioning and flap inset are essential to decrease joint stiffness and improve comfort during the immobilization period.

The vascular anatomy of abdominal flaps is highly reliable and constitutes one of their major advantages. Blood supply is mainly derived from the deep inferior epigastric artery, superficial circumflex iliac artery, and superficial external pudendal artery, which provide robust perfusion capable of supporting large soft tissue transfers (9,10). This vascular reliability enables the reconstruction of extensive dorsal hand defects while preserving flap viability even in compromised recipient beds. Additionally, the abdominal donor site offers abundant tissue with acceptable donor-site morbidity and relatively concealed scars.

Abdominal pedicled flaps are particularly useful in dorsal hand reconstruction because they provide thick, durable, and well-vascularized tissue capable of protecting exposed tendons, joints, and neurovascular structures (5). Their versatility allows flap tailoring according to the shape and dimensions of the defect. In cases of severe infection, the transfer of vascularized tissue may also improve local immune response and antibiotic delivery, facilitating wound healing and reducing the risk of recurrent infection (6). Diabetic hand infections represent a severe clinical entity associated with significant morbidity and risk of limb loss. Poor glycemic control contributes to impaired leukocyte function, peripheral neuropathy, microvascular compromise, and delayed wound healing, all of which predispose patients to aggressive soft tissue infections (8,14). Early recognition and aggressive surgical management are essential to prevent progression to deep tissue necrosis, osteomyelitis, and systemic sepsis. In the present case, prompt surgical debridement combined with serial wound exploration allowed adequate infection control before definitive reconstruction.

Serial debridement remains one of the cornerstones in the management of complex infected hand wounds. Repeated removal of devitalized tissue decreases bacterial burden and allows better assessment of tissue viability (6). In our patient, six surgical debridement procedures were necessary before achieving a suitable wound bed. This staged approach is commonly recommended in severe diabetic hand infections because the extent of tissue necrosis may initially be underestimated.

Negative pressure wound therapy (NPWT) also played a critical role in our patient's management. NPWT has demonstrated significant benefits in complex wounds by reducing edema, increasing local blood flow, promoting angiogenesis, stimulating granulation tissue formation, and decreasing bacterial colonization (7,15). Several studies have shown that NPWT can improve wound bed preparation and increase the success rates of subsequent reconstructive procedures, particularly in infected or traumatic wounds (7,15).

One of the principal advantages of pedicled abdominal flaps is that secondary thinning procedures can be safely performed once flap viability has been established. Because these flaps possess robust vascularity, progressive debulking may be carried out to improve contour, tendon gliding, and hand mobility without significantly compromising perfusion (1,4). Secondary procedures may therefore optimize both functional and cosmetic outcomes, especially in dorsal hand reconstruction where excessive tissue bulk may interfere with dexterity and grip function.

Functional rehabilitation represents another critical aspect of postoperative management. Prolonged immobilization associated with pedicled flap reconstruction may contribute to stiffness and reduced range of motion if rehabilitation is delayed (4). Early referral to specialized hand therapy following flap division is essential to restore grip strength, dexterity, and joint mobility. In our patient, rehabilitation contributed significantly to the favorable functional outcome and recovery of hand function.

The survival rates and long-term outcomes of abdominal pedicled flaps remain highly satisfactory. Jabaiti et al. reported an 85.3% flap survival rate, with only isolated cases of complete flap loss (2). Similarly, Jaramillo et al. demonstrated excellent viability and low complication rates using vertical abdominal flaps for complex hand reconstruction (3). Chim and Moran also described favorable long-term functional outcomes and durable soft tissue coverage in patients reconstructed with pedicled abdominal flaps (4). Other authors have similarly reported that these flaps continue to provide dependable results in challenging reconstructive scenarios (12,13).

Recent advances in reconstructive surgery have attempted to overcome some of the classic limitations of abdominal flaps. Perforator-based abdominal flaps, including deep inferior epigastric artery perforator (DIEP)-based techniques, provide greater flexibility, improved arc of rotation, reduced donor-site morbidity, and superior aesthetic outcomes while maintaining excellent vascular reliability (9,16). Despite these innovations, conventional abdominal pedicled flaps continue to maintain a complementary and highly relevant role, particularly in resource-constrained environments or in patients who are not ideal candidates for free tissue transfer.

This case highlights the continued relevance of pedicled abdominal flaps as a safe, versatile, and effective reconstructive option for complex dorsal hand defects associated with severe infection and extensive soft tissue loss. Careful patient selection, aggressive infection control, meticulous surgical planning, staged reconstruction, and structured postoperative rehabilitation remain essential factors for achieving favorable functional and aesthetic.

## Conclusion

Pedicled abdominal flaps continue to represent a safe, reliable, and versatile reconstructive option for complex dorsal hand defects, particularly in patients with severe soft tissue loss, active infection, significant comorbidities, or limited access to microsurgical reconstruction. Although free tissue transfer remains the gold standard for upper extremity reconstruction, abdominal pedicled flaps maintain an important role in contemporary reconstructive surgery due to their dependable vascularity, technical reproducibility, and ability to provide durable soft tissue coverage.

This case demonstrates that successful outcomes can be achieved through aggressive infection control, serial surgical debridement, appropriate wound bed preparation with negative pressure wound therapy, meticulous surgical planning, and structured postoperative rehabilitation. In our patient, the use of a pedicled abdominal flap resulted in complete flap integration, preservation of hand function, satisfactory aesthetic recovery, and absence of major complications.

Despite the evolution of microsurgical techniques, pedicled abdominal flaps remain an effective alternative in selected patients and resource-limited settings. Their continued use highlights the importance of individualized reconstructive strategies tailored to patient characteristics, wound complexity, and available surgical resources.

## Conflicts of interests

The authors declare that there are no financial, personal, or institutional conflicts of interest that could have influenced the work reported in this manuscript.

## References

1. Sabapathy SR, Bajantri B. Indications, selection, and use of distant pedicled flap for upper limb reconstruction. *Hand Clin.* 2014;30(2):185-99.
2. Jabaiti S, AlMugaren FM, Alotaibi MN, AlQahtani SM. Abdominal pedicled flaps for complex hand reconstruction: outcomes and complications. *Plast Reconstr Surg Glob Open.* 2020;8(9):e3125.
3. Jaramillo D, Mesa J, Restrepo J, et al. Vertical abdominal flap for reconstruction of complex hand defects. *J Hand Surg Am.* 2018;43(5):487.e1-487.e7.
4. Chim H, Moran SL. Long-term outcomes of pedicled abdominal flaps in hand and upper-extremity reconstruction. *Hand Clin.* 2014;30(2):201-12.
5. Friedrich JB, Vedder NB. Soft tissue reconstruction of the hand. *J Hand Surg Am.* 2009;34(6):1148-55.
6. Hudson DA, Knottenbelt JD, Krige JE. Closed continuous irrigation for the treatment of hand infections. *J Hand Surg Br.* 1993;18(4):524-6.
7. Orgill DP, Bayer LR. Negative pressure wound therapy: past, present and future. *Int Wound J.* 2013;10 Suppl 1:15-9.

8. Attinger CE, Brown BJ. Amputation and ambulation in diabetic patients: function is the goal. *Diabetes Metab Res Rev.* 2012;28 Suppl 1:93-6.
9. Saint-Cyr M, Schaverien M, Wong C, et al. The perforasome theory: vascular anatomy and clinical implications. *Plast Reconstr Surg.* 2009;124(5):1529-44.
10. Mathes SJ, Nahai F. *Reconstructive Surgery: Principles, Anatomy and Technique.* New York: Churchill Livingstone; 1997.
11. Levin LS. The reconstructive ladder. An orthoplastic approach. *Orthop Clin North Am.* 1993;24(3):393-409.
12. Lineaweaver WC, Buncke HJ, Buncke GM. Principles and applications of microsurgery. In: Green DP, editor. *Green's Operative Hand Surgery.* 5th ed. Philadelphia: Elsevier Churchill Livingstone; 2005. p. 1595-1625.
13. McGregor IA, Jackson IT. The groin flap. *Br J Plast Surg.* 1972;25(1):3-16.
14. Fitzgerald O'Connor EJ, Vesely M, Holt PJ. Diabetic hand infections: factors at presentation influencing amputation and number of surgical procedures. *J Hand Surg Eur Vol.* 2011;36(9):709-14.
15. Stannard JP, Volgas DA, Stewart R, McGwin G Jr, Alonso JE. Negative pressure wound therapy after severe open fractures: a prospective randomized study. *J Orthop Trauma.* 2009;23(8):552-7.
16. Blondeel PN, Morris SF, Hallock GG, Neligan PC. *Perforator Flaps: Anatomy, Technique & Clinical Applications.* 2nd ed. Boca Raton: CRC Press; 2013.

Axell Daniel Lugo Rodríguez  
General Surgery Department  
Instituto Mexicano del Seguro Social  
Unidad Médica de Alta Especialidad H.E. No. 71  
Torreón, Coahuila, México