

The Role of Plastic Surgery for Soft Tissue Coverage of the Diabetic Foot and Ankle

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KEYWORDS

- Wound healing • Diabetic foot and ankle • Soft tissue coverage • Wound closure
- Flaps • Skin grafts

KEY POINTS

- Diabetic foot and ankle reconstruction closure can be assisted with a thorough knowledge of flap and grafting techniques.
- Plastic surgery algorithms have been updated to include more aggressive flaps and grafting to obtain closure of defects in foot and ankle surgery.
- Be vigilant in patient selection and a thorough work-up prior to surgery will assist in obtaining optimal results.

The goal of wound healing is to obtain the best closure through the least morbid means. In the surgical treatment of the diabetic foot and ankle, the reconstructive foot and ankle surgeon is tasked with the challenge of repairing a variety of tissue defects. The decision for wound closure depends on the location of the wound and host factors (ie, tissue extensibility and the individual's healing potential). In order of increasing complexity, the clinician should consider the following reconstruction decision ladder algorithm, as set forth by Attinger and Janis.¹ According to this algorithm (**Table 1**), appropriate wound closure process should be performed by (1) performing primary closure of said wound; (2) allowing the wound to close by secondary intention, including application of various wound care products; (3) application of a negative-pressure wound vacuum system; (4) skin grafting; (5) application of dermal matrices; (6) local random flaps; (7) distant flaps; (8) tissue expansion procedures; and, finally, (9) local fasciocutaneous or myofasciocutaneous flaps, island flaps, or free tissue transfers.¹⁻¹² Wound evaluation coupled with the knowledge of various closure techniques and their indications will arm the surgeon with the tools for a successful closure.

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Type of Closure	Morbidity
Free flap	Most morbid
Tissue expansion	—
Distant flaps	—
Local flaps	—
Dermal matrices	—
Skin graft	—
Negative-pressure wound therapy	—
Closure by secondary intention	—
Primary closure	Least morbid

From bottom up there is a relationship between ease and least morbid to most difficult with morbidities after previous rungs have been attempted.

Adapted from Janis JE, Kwon RK, Attinger CE. The new reconstructive ladder: modifications to the traditional model. Plast Reconstr Surg 2011;127(Suppl 1):205S–125.

GENERAL PRINCIPLES FOR SUCCESS IN FLAPS AND GRAFTS

Planning is the most important step, and doing the planning before any incision, including an excision of the initial ulcer, is paramount. Considerations of general health, source of blood for the flap and graft, ensuring use of atraumatic technique, and minimizing the amount of undermining are critical. External factors, such as compliance, vascular status of the patient, and bony prominences, should be evaluated and never underestimated.

From a 2004 review about grafts and flaps, the success rate is well demonstrated. Using a combination of split-thickness skin grafts, local flaps, and free flaps, 56% of the patients achieved closure before discharge.¹³ Even more, after performing 162 flaps in severely burned wounds of extremities, the survival rate of the flaps was 93.2%.¹² Both grafts and flaps are very viable methods to achieve closure of wounds in foot and ankle reconstruction.

PATIENT HEALTH PARAMETERS

Patients with illness complicate the workup and planning phase. Increases in many chronic diseases complicate and necessitate full history and physicals. Patients with comorbidities, such as diabetes mellitus; hypertension/hyperlipidemia; peripheral vascular disease; chronic or acute anemia; autonomic, sensory, or motor neuropathy; end-stage renal disease; active infection; history of coagulation abnormalities, including protein S deficiency; age of the patient; musculoskeletal limitations; and use of tobacco, should be addressed preoperatively and optimized.¹⁴ Patients taking medications that affect coagulation, such as aspirin, warfarin, or heparin, must be appropriately managed. Many systemic medications, such as corticosteroids and chemotherapeutic and immunosuppressive drugs, may interfere with wound healing and this should be assessed before surgery.^{15,16}

The lower extremity must be assessed for vascular and neuropathic risk factors. Positive findings of vascular insufficiency may require further consultation. The indications for vascular consultation include an ankle brachial index of less than 0.7, toe blood pressure less than 40 mm Hg, or transcutaneous oxygen tension (TcPO₂) levels

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