

Soft Tissue Coverage in Abdominal Wall Reconstruction

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KEYWORDS

- Abdominal wall reconstruction • Hernia • Surgical mesh
- Reconstructive surgical procedures • Surgical flaps

KEY POINTS

- Soft tissue reconstruction in the abdominal wall requires an algorithmic anatomic approach based on defect location.
- The decision to select a locoregional flap or a free flap is determined by defect surface area, local donor flap options, and availability of recipient vessels.
- Patient systemic comorbidities, locoregional wound conditions, and the possibility of early/late reoperation must be factored into flap selection.
- Reconstruction of complex abdominal wall defects that involve both musculofascial repair and soft tissue replacement highlight the importance of coordinated collaboration between general surgeons and plastic and reconstructive surgeons.

The need for soft tissue coverage in abdominal wall reconstruction suggests a loss of tissue beyond the availability of local tissue to be recruited to resurface the defect. Because most abdominal wall defects can be reconstructed with the redundant tissue usually found in the truncal area of most patients, these defects represent a more complex subset of abdominal wall reconstructions. Indications for flap coverage vary by cause of defect, defect type, and timeline for closure. Multiple clinical scenarios can lead to a loss of abdominal wall soft tissue requiring replacement including oncologic resection, traumatic injury, radiation-associated wounds, skin necrosis, superficial soft tissue infection, and septic evisceration. The amount of soft tissue loss and amount of coverage able to be performed with local skin advancement must be factored into the reconstructive plan. Abdominal wall defects requiring soft tissue coverage can be classified as partial-thickness defects, involving the skin and

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subcutaneous tissue only, or full-thickness composite defects, which involve loss of the abdominal wall musculofascia in addition to the overlying skin and subcutaneous tissue. The indications for soft tissue replacement in abdominal wall reconstruction also depend on the chronicity of the wound defect, with some defects benefiting from early soft tissue coverage and others being more appropriate for delayed flap coverage, whereas some defects might be better served with chronic wound care and healing by secondary intention.

In the past, abdominal wounds were treated with wound care and allowed to heal over time by secondary intention, or were reconstructed with a skin graft after the local wound environment was optimized. This approach resulted in a protracted course of care and significant morbidity. In time, the concept of delayed primary closure gained popularity, allowing certain patients with favorable wound characteristics to undergo closure after a short period of a few days instead of being committed to weeks or months of open wound care (Fig. 1).

Soft tissue flap reconstruction offers significant advantages compared with delayed primary or secondary healing wound closure. Flap reconstruction is performed in a single-stage procedure obviating chronic wound management. Flap reconstruction offers immediate and definitive wound closure mitigating the local milieu inflammatory response and local tissue injury. In reconstructions involving bioprosthetic mesh these two factors are critical in that, if the mesh is interposed between two well-vascularized tissue planes (posterior abdominal wall/peritoneal cavity and a soft tissue flap superficially), then bilaminar vascular ingrowth can be achieved, accelerating the period of bioprosthetic mesh revascularization and incorporation. In addition, a closed wound environment diminishes the proinflammatory state of an open wound, which limits the degree of enzymatic degradation of the bioprosthetic mesh during the incorporation phase.

Over the last 15 years, negative-pressure wound therapy (NPWT) has revolutionized the approach to wound care, particularly in the abdominal wall. NPWT allows preservation of the wound environment by managing fluid losses, decreasing bacterial contamination, and accelerating granulation tissue formation. In abdominal wall reconstruction this preserves the option for delayed closure by flap reconstruction or delayed primary closure.

Planning for flap reconstruction in the abdominal wall must factor defect type, defect location, availability of surrounding soft tissue, and, in certain cases, planned reoperation. Flap reconstructions can be classified by where the tissue is recruited and their blood supplies: local flaps, random or axial; regional flaps, pedicled; and free flaps, microanastomoses.

LOCAL FLAP OPTIONS

Local flaps involve recruiting tissue adjacent to the wound defect. Well-planned incisions are critical to preserve blood supply to the local flap and avoid wound healing complications at the donor site used to resurface the wound defect. There are various flap transposition designs available including advancement, rotation/advancement, interpolation, V-Y advancement, and bipedicled flaps. These flaps can be oriented in various dimensions, including vertical, oblique, and horizontal. These flaps are perfused through random or axial blood supplies, so understanding of the vascular anatomy in terms of abdominal wall angiosomes and perforator location is critical to designing robust local flaps.

It is also important to consider the impact of preexisting incisions in the abdominal wall when planning a flap design. A midline laparotomy may preclude harvesting a

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