Posterior Elbow Wounds
Soft Tissue Coverage Options and Techniques

Ketan M. Patel, MD, James P. Higgins, MD*

KEYWORDS

• Posterior elbow wounds • Olecranon wounds • Elbow reconstruction • Flaps
• Upper extremity flaps

KEY POINTS

- Aggressive wound preparation is crucial to ensure success with reconstructive techniques.
- Early considerations for protection of the ulnar nerve may prevent injury with repeat surgery.
- A Doppler Allen examination before radial forearm flap harvest will help minimize donor site morbidity following flap harvest.
- The reversed lateral arm flap provides versatile and reliable soft tissue coverage for the posterior elbow region.
- Local perforator-based propeller flap options can be successfully used with limited donor site morbidity.

INTRODUCTION

Advances in upper extremity soft tissue reconstruction have been paralleled by the precise description and characterization of soft tissue vascular anatomy. The number and variety of wound management and coverage options have increased, allowing surgeons to tailor their treatment plans to the requirements of each clinical scenario.

Reconstructive Principles

The soft tissue envelope of the posterior elbow is a common site of wound complications because of a confluence of issues. Its location and prominence make it an area at risk in high-energy trauma. Surgical treatment of complex elbow fractures commonly uses the posterior approach for extensile access to the medial and lateral aspects of the joint, leaving the olecranon at risk for wound dehiscence and potential hardware exposure. Infectious or inflammatory olecranon bursitis also risk tissue breakdown in this difficult location. Finally, the anatomic location of this tissue over the apex of a joint capable of more than 130° of flexion exposes these wounds to tension and motion, further inhibiting healing and risking dehiscence. The reasons that put this location at risk of chronic wound development also make the prospect of success with local wound care unlikely. Local debridement and dressing changes may commonly succeed in decreasing the size of the wound but may fail to achieve final and stable closure.

Failure of local wound care is followed by consideration given to local skin flap advancement or rotation flaps. In assessing areas adjacent to a wound, mobility and pliability are often related to the chronicity of the wound. Long-standing wounds have varying degrees of inflammation

Financial Disclosure: All authors have no conflicts of interest or financial disclosures. No funding was used for the preparation of this article.
Curtis National Hand Center, MedStar Union Memorial Hospital, 3333 North Calvert Street, Baltimore, MD 21218, USA
* Corresponding author. 3333 North Calvert Street, Baltimore, MD 21218.
E-mail address: jameshiggins10@hotmail.com

Orthop Clin N Am 44 (2013) 409–417
http://dx.doi.org/10.1016/j.ocl.2013.03.011
0030-5898/13/$ – see front matter

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and loss of tissue elasticity. These conditions make local tissue rearrangement and local flap options less feasible. Attempts at local skin advancement are performed with postoperative extension splinting to minimize tissue tension. These efforts are limited by the concern for creation or exacerbation of elbow stiffness with prolonged immobilization. If these conservative measures fail, more involved flap coverage is considered.

With pedicled transfer options, understanding the type and extent of previous surgeries/injuries may limit available flap options. A prior lateral approach to a humerus fracture, for example, will compromise vascular supply to the lateral arm flap and eliminate this option for reconstruction. Similarly, radial artery damage can compromise the vascularity for a pedicled radial forearm flap. The need for evaluation of the integrity of the superficial arch of the hand is heightened in the setting of concomitant more distal injury to the hand if radial forearm flap harvest is being considered.

Preoperative Considerations

Preoperative considerations before olecranon coverage are many and are related to the complexity and extent of the wound.

The status of the underlying bone will alter surgical plans significantly. In the setting of chronic atraumatic olecranon wounds, superficial osteomyelitis is anticipated and saucerization of the exposed and contaminated bone is required before flap elevation and closure. Posterior elbow wounds encountered after fracture management are more complex. Consideration must be given to removal of exposed hardware and debridement of exposed fractures. This can be considerably complicated if the fracture is not yet healed and current fixation is considered ideal or irreplaceable. In these settings, contaminated hardware may be preserved after debridement and irrigation in pursuit of delaying hardware removal until fracture union is achieved. In these difficult settings, the risk of loss of fracture fixation must be weighed against the risks of temporary preservation of contaminated implants.

The complexity and intra-articular involvement of underlying fractures may make the anticipation of stiffness a near certainty, and should alert the reconstructive surgeon to the possibility of future surgeries in the same field. Elbow capsulectomy, for example, may be significantly easier if performed through a matured fasciocutaneous flap than a less pliable and mobile muscle flap.

The ulnar nerve should always be given consideration in preoperative planning for posterior elbow coverage. If the nerve has not been previously transposed, the surgeon should consider transposition if the wound debridement or flap elevation will expose the nerve and leave the cubital tunnel at risk for scarring or compression. If a future capsulectomy requiring medial column dissection is anticipated, ulnar nerve transposition may also be helpful in avoiding future nerve injury.

The vascular status of the various flaps described herein is not routinely assessed with preoperative studies with the exception of the radial forearm flap. If the radial forearm flap is planned as the primary or backup procedure, a careful Allen test is performed to ensure that the perfusion to the hand would not be compromised with absence of the radial artery inflow. The authors perform this in the office with the use of a surface Doppler probe. This does not provide quantitative measurements and must be interpreted critically to determine if radial forearm flap harvest is safe. The authors require that the quality and intensity of the Doppler signal audible on the volar pads of the digits (with particular attention given to the thumb) remain unchanged after manual compression of the radial artery at the wrist.

Finally, consideration should be given to the size and location of the wound anticipated after debridement with the elbow in full flexion. A fibrotic infected wound assessed before debridement with the elbow extended may greatly underestimate the size and location of tissue required.

Flap Options and Techniques

Various muscle, fasciocutaneous, and cutaneous flaps have been described as coverage options for posterior elbow wounds. The most common flaps used for this area include the reversed lateral arm, latissimus dorsi, brachioradialis, flexor carpi ulnaris, radial forearm, and local perforator-based cutaneous flaps. These flap types are discussed and advantages and limitations of each type of flap are highlighted.

Lateral arm flap

Anatomy The lateral arm flap is a versatile flap used for pedicled transfer to the posterior elbow region. The vascular anatomy permits this flap to be used as an antegrade or retrograde ("reversed") pedicled flap. This septofasciocutaneous flap is based on the posterior branch of the radial collateral artery (PRCA), which arises from the profunda brachial artery. This vessel courses along the periosteum of the lateral column of the humerus and is elevated with the lateral intermuscular septum and overlying skin.