The Freeing Of Hands For Open Reduction and Internal Fixation

Yuri M. Lewicky, MD

This article presents a simple technique for consistent arm positioning during open reduction and internal fixation of fractures.

Operative repair of fractures is most efficiently achieved when an experienced surgical team is involved. Expertise and familiarity with instrumentation as well as the benefit of adequate exposure cannot be overstressed. Training programs typically have access to the latest instrumentation and experienced surgical teams, not to mention an overabundance of helpful hands in the surgical suite. For the physician in private practice, the helpful hands of an attending surgeon, chief or junior resident, or medical student are echoes of the past; they are replaced by those of a single surgical technician whose job already involves instrumentation hand-off. Because of this, physician assistants and first assists are becoming more prevalent at a cost of increased physician overhead.

Today's physician must be conscious of not only the patient, but also the economic aspects of the care given. The ultimate goals remain to "first do no harm" while providing the best possible care to the patient, and second to do this in a timely and efficient manner.

Traditionally, the surgical approach to both-bone forearm fractures and isolated olecranon fractures has been performed with the patient in the supine position.[1-5] The forearm commonly is approached via two incisions, a volar Henry approach for the radius and a subcutaneous ulnar border approach for the ulna.[2,4] The single-incision Boyd exposure for the proximal radius and ulna is not recommended due to a high incidence of synostosis and a resultant loss of forearm rotation.[6-8]

Whereas access to the radius can be conveniently achieved on a hand table, access to the ulna cannot due to the forearm being flexed 90° at the elbow with the hand positioned towards the ceiling. Elbow flexion of this magnitude necessitates an assistant holding the arm for the duration of the surgical approach to the ulna. Olecranon fractures typically have been approached via a posterior midline incision with attention to curving around the prominent subcutaneous olecranon tip to avoid pressure sensitivity.[1,3,5] These fractures also necessitate an assistant to maintain the arm in an across-the-chest position with the elbow flexed 90°. Both of these procedures have the inherent problem of intraoperative arm position maintenance.

Proper arm position management can facilitate fracture repair while decreasing operative time and surgeon frustration. This article presents a maneuver to facilitate operative intervention when assistance is limited. The main advantage of this technique is the freeing of the surgical scrub technicians' hands for handling of retractors and administration of instruments.

Diaphyseal Forearm Fractures

The patient is placed supine on the operating table with the hand table attachment centered at the patient's shoulder. A folded sheet, serving as a bump, is placed under the patient's contralateral hip to facilitate a supinated position of the forearm. A tourniquet is placed as proximal as possible on the arm over cast padding. Folded blankets, approximately 18×10 inches, are placed longitudinally over the tourniquet on the brachium, stacked to a height equal to the distal radioulnar joint of the involved forearm when

Dr Lewicky is from the Department of Orthopedic Surgery, Arizona Health Sciences Center, Tucson, Ariz.

Reprint requests: Yuri M. Lewicky, MD, Dept of Orthopedic Surgery, Arizona Health Sciences Center, PO Box 245064, Tucson, Az 85724-5064.

Figure 1: Positioning for exposure of the ulna: Longitudinally stacked blankets have been placed over the affected forearm's brachium maintaining at least one hand breadth (12 cm) or more of distance between the bolster and the antecubital crease. **Figure 2:** Koban hand wrap with Allis clamp anchor point on radial border of 1st metacarpal. **Figure 3:** Facilitated ulnar exposure with Allis clamp/ring forceps union.

the elbow is flexed to 90°. Care should be taken to ensure that the most distal extent of the stacked blankets corresponds to ⩾12 cm proximal from the antecubital crease.

Due to the unique anatomy of each patient, the amount of blanket overlap on the chest wall will vary. In doing this, sterile prepping of the arm is not hindered. The blankets are then secured to the table by crosswise taping with 4-inch cloth tape (Figure 1). The patient's forearm is flexed once again to 90° to ensure no further adjustments are needed prior to sterile preparation. After sterile preparation, the patient's arm is then draped with a down sheet, a tourniquet towel with towel clip, a hand drape and a shortened, medium-sized stockinet. The stockinet is wrapped with a 4-inch Coban self-adhesive wrap (3M, St Paul, Minn) so only the hand to the level of the distal wrist crease is enclosed, allowing full access to the wrist and forearm. Additionally a small loop of excess Coban should be incorporated with the wrap along the radial border of the 1st metacarpal (Figure 2). This loop serves as an anchor point for an Allis clamp and prevents inadvertent pinching of the skin.

The arm is exsanguinated with an Esmarch bandage and the surgical procedure is initiated. The radius is approached in a standard volar Henry fashion. When approaching the ulna, an Allis clamp is clipped onto the Coban anchor point and the elbow is flexed 90°. A closed-ring forceps is then threaded through one of the finger rings of the Allis clamp handle and clamped through the drapes directly to the stacked blankets at a distance from the hand that allows for adequate traction on the arm. The ring forceps should be clamped perpendicular to the Allis clamp to prevent a loss of traction from sliding of the Allis clamp/ring forceps union (Figure 3). By clipping the Allis clamp along the radial border of the first metacarpal, the forearm is maintained in neutral rotation with the subcutaneous border of the ulna maximally presented to the surgeon for open reduction and internal fixation.

Olecranon Fractures

The patient is placed supine on the operating table. Folded blankets, approximately 18×10 inches, are stacked transversely on the patient's chest to a height so that when the elbow is flexed 90° and the shoulder is flexed and internally rotated 90°, the forearm rests across the chest parallel to the floor. The blankets are then secured to the table by crossed taping with 4-inch cloth tape (Figure 4). The patient's arm is positioned across the chest to ensure no further adjustments are needed prior to sterile preparation. After sterile preparation and draping to the axilla, a sterile tourniquet is placed as proximal as possible on the arm over sterile cast padding. A medium-sized stockinet is wrapped with a 4-inch Coban to the level of the distal third of the forearm. As previously described, a small loop of excess Coban should be incorporated with the wrap along the radial border of the 1st metacarpal serving as an anchor point.

The arm is exsanguinated with an Esmarch bandage. The patient's arm is placed across the chest, and an Allis clamp is attached to the Coban anchor

point. A closed-ring forceps is then threaded through one of the finger rings of the Allis clamp handle and clamped through the drapes directly to the stacked blankets at a distance from the hand that allows for adequate traction on the arm. The ring forceps should be clamped perpendicular to the Allis clamp to prevent a loss of traction from sliding of the Allis clamp/ring forceps union (Figure 5). The surgical procedure is initiated via a standard posterior approach. When attempting reduction, the ring forceps should be disconnected and the arm extended to minimize olecranon tension.

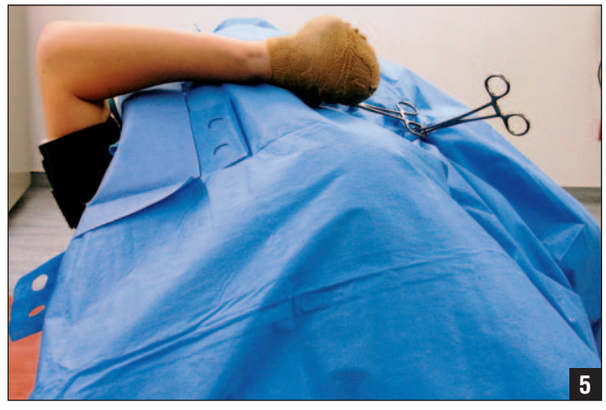

Figure 4: Positioning for exposure of the olecranon. Transversely stacked blankets allow for cross chest placement of the affected arm parallel to the floor. **Figure 5:** Olecranon exposure with Allis clamp/ring forceps union.

Discussion

It is well described in the literature that displaced bothbone forearm fractures in adults require operative open reduction and internal fixation to maintain a functional arc of supination and pronation.[2] Additionally the traditional extensile volar Henry approach to the radius and the lateral subcutaneous approach to the ulna have been most commonly employed. Supine positioning with the arm abducted onto the hand table allows for easy access volarly to the radius. When approaching the ulna, the elbow must be flexed 90° to present its subcutaneous border. Because of the need for extra hands to hold the forearm in this flexed position, some surgeons have opted to place the patient in a prone position where the ulna is approached with the forearm in pronation and the radius approached with the forearm in supination.[2] Problems with this include patient discomfort with regional block anesthesia, airway maintenance, and increased anesthetic risks associated with a poor position for lung compliance in a medically compromised patient.

For olecranon fractures, patient positioning most commonly includes a supine position with the arm across the chest or alternatively a lateral decubitus or prone position. The use of a weighted speculum hung off the contralateral side of the bed and an arm holder have been previously described.[5] The inherent problems with this setup are that a circulator must be constantly available to position the nonsterile speculum when the addition or removal of traction is required, and that attempts at clamping a semi-rigid arm holder can be difficult. Finally, depending on the patient's arm size, a weighted speculum may not supply enough counterforce to maintain the arm in an across-the-body position.

Literature dedicated to patient positioning is sparse, and when available it often consists of a sentence or two in most surgical technique descriptions. The importance of proper patient positioning should not be minimized in any surgical procedure. It should be included in the preparatory phase of an operation and considered a critical component towards achieving a smooth surgical procedure. The "freeing of the hands" technique allows for better resource allocation and avoidance of an assistant becoming an arm holder.

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