



Basics of Elbow Arthroscopy Part III: Positioning and Diagnostic Arthroscopy in the Lateral Decubitus Position

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Abstract: In recent years, arthroscopy has gained popularity as a preferred treatment of a multitude of pathologies affecting the elbow. Since its initial description in 1985, many modifications have been made as our knowledge and technology have advanced. Currently, the majority of arthroscopic procedures are performed in either the lateral decubitus or supine suspended position. In this work, we discuss the history, patient positioning, and key steps for performing elbow arthroscopy in the lateral decubitus position. In addition to key steps, a number of strengths and limitations of this set up are discussed in detail. When properly executed, elbow arthroscopy can be performed in a safe and efficient manner with minimal risk to patients.

Elbow arthroscopy is rapidly becoming a valuable method for treating a multitude of elbow pathologies. Over the last 30 years, significant advancements have been made, and the technique continues to be refined with increasing experience. In addition to improved instrumentation and surgical techniques, the equipment used to position patients and control the arm during surgery has also evolved.¹⁻⁴ When first described in 1985 by Andrews et al.,² patients were positioned supine with the arm out to the side. Several years later in 1989, prone positioning for elbow arthroscopy was first described by Poehling et al.⁴ Although this position was initially favored by many surgeons, it has largely been abandoned owing to the

increased time required for patient positioning and the decreased intraoperative airway access.

In 1992, O'Driscoll and Morrey first described a modification of prone positioning by placing the patient in the lateral decubitus position with the arm flexed over an arm holder.¹ This maintains the benefits of prone positioning, conferring similar access to the elbow, with significantly fewer drawbacks (Table 1). Specifically, it permits access to the airway and allows operation under regional anesthesia.¹ Advantages of this position include the ability to freely manipulate the elbow during surgery, increased stability of the arm, ready access to the posterior joint, and no need for a mechanical arm holding device.^{1,5-7} It is limited by decreased access to the anterior compartment if the patient is not properly positioned and difficultly converting to open surgery on the medial side of the elbow when indicated.⁵ In this third installment on the Basics of Elbow Arthroscopy, we provide a detailed video (Video 1) and description on how to place the patient in the lateral decubitus position and perform a diagnostic elbow arthroscopy. In previous parts, the basics of elbow anatomy and portal placement were discussed (Part I) and elbow arthroscopy for the supine position (Part II) was covered. It is our hope that this series will provide emerging elbow arthroscopists with basic knowledge and instruction that is critical to success in this growing field of orthopaedic surgery.

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Table 1. Comparison of the Strengths and Limitations of Performing Elbow Arthroscopy in the Lateral Decubitus Position Versus the Supine-Suspended Position

Supine Position	Lateral Decubitus Position
Strengths	
Unobstructed access to the airway for anesthesia	Improved airway access compared with prone position
Gravity pulls anterior neurovascular structures away from the joint	Ready access to posterior elbow with anatomic orientation of structures
Allows arm to be freely positioned in space	Can easily be converted to open procedure posteriorly or laterally
Flexion and extension can be fixed without an assistant	Allows for free flexion and extension of elbow intraoperatively
Elbow can be removed from arm holder for easy conversion to open procedure if required	Elbow maintained in stable position
	Traction device not required
Limitations	
Requires mechanical traction device	Airway not as accessible as supine position
Some feel arthroscopic orientation is difficult to navigate without significant experience	If not properly positioned, anterior elbow access can be compromised
Posterior compartment access can be limited if elbow is flexed too much	Medial elbow may be more difficult to access for open surgical procedures
Arm may feel unstable if not positioned and secured properly	Slightly more difficult positioning of patient compared with supine technique

Technique

Operating Room Setup

Prior to patient positioning, the operating room must be appropriately prepared and organized. Standard arthroscopy instrumentation should be available, including a 4-0 mm, 30° arthroscope, blunt trochars, solid cannulas, arthroscopic shavers, biters, and radio-frequency ablation devices. An arthroscopic pump or gravity inflow may be used. Typically, the surgeon will stand perpendicular to the operating table on the opposite side of the operative extremity (i.e., stand on left side of table for a right elbow scope). Arthroscopy monitors must be positioned on the opposite side of the table from the surgeon. An inflatable bean bag and axillary roll are required both to maintain the patient's position and to prevent compression injury to neurovascular structures.

Patient Setup and Positioning

Once anesthesia has been induced, the patient is placed in the lateral decubitus position with the operative extremity up. The axillary roll is positioned, and the bean bag (Natus, Pleasanton, CA) is molded to the patient's body to support his or her torso, with padding placed under the knee and ankle to protect against compressive neuropathies. Optimal positioning involves having the patient leaning slightly forward, so that the elbow of the operative extremity extends well beyond the edge of the operative table. This allows uninhibited access to the medial and lateral aspects of the elbow for portal placement, while also allowing intraoperative elbow flexion to improve anterior compartment visualization. If needed, a supplementary bolster may be positioned behind the patient's back supporting the bean bag, to prevent the patient from leaning backwards, which subsequently limits access to the anterior compartment.

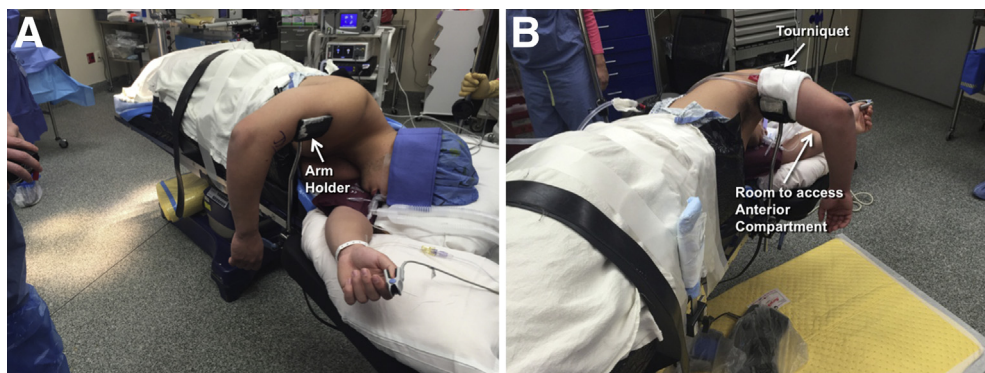


Fig 1. (A) When operating on the right elbow, the patient is placed in the left lateral decubitus position with the arm positioned on an arm holder. (B) A nonsterile tourniquet is applied prior to prepping and draping. It is critical that the arm be positioned so that the humerus extends beyond the edge of the table and that there is plenty of space between the arm holder and the antecubital fossa.

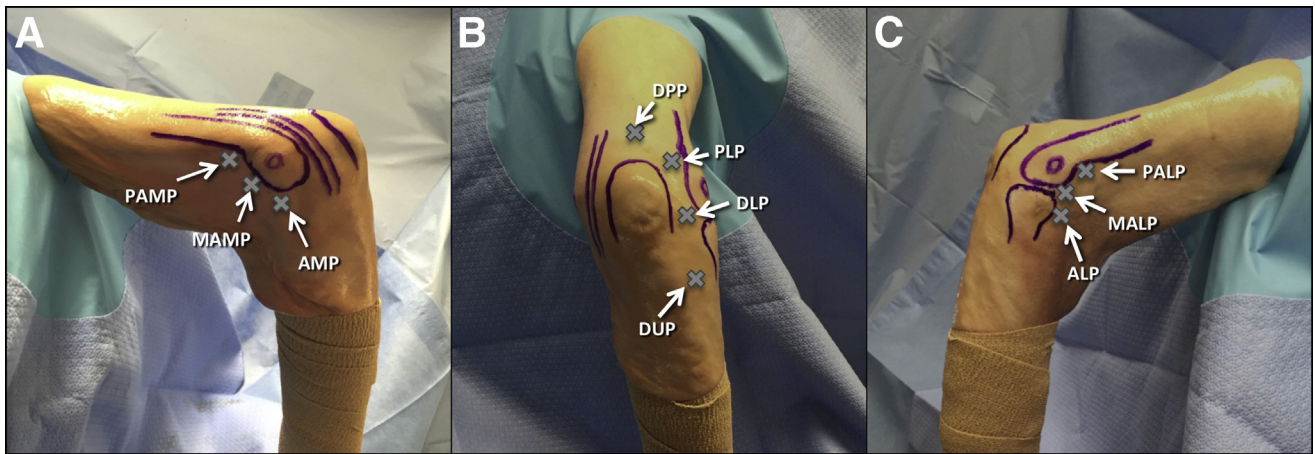


Fig 2. On this right elbow in the lateral decubitus position, the most commonly used portals to access the elbow are viewed from the medial (A), posterior (B), and lateral sides (C). (A) Medially, the proximal anteromedial portal (PAMP), midanteromedial portal (MAMP), and anteromedial portal (AMP) are commonly used. (B) The most common posterior portals include direct posterior portal (DPP), posterolateral portal (PLP), direct lateral portal (DLP), and the distal ulnar portal (DUP). (C) On the lateral side of the elbow, the proximal anterolateral portal (PALP), midanterolateral portal (MALP), and anterolateral portal (ALP) have all been described.

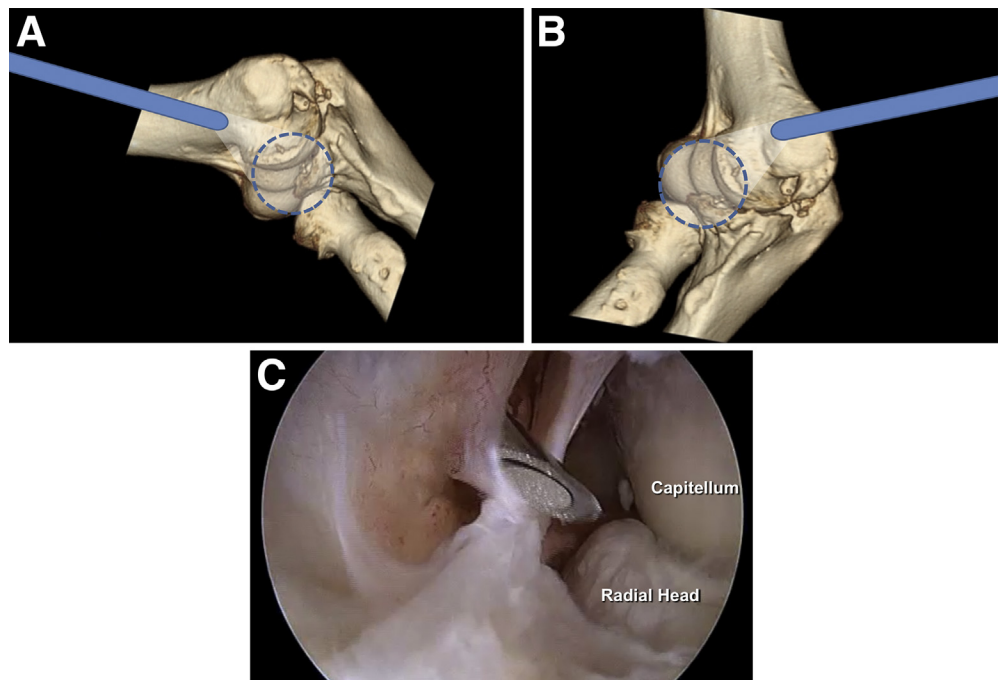
Depending on surgeon preference, an unsterile or sterile tourniquet can be used. A low-profile, padded arm holder is then positioned in front of the patient to support the proximal humerus. Although the arm holder we use was fabricated internally, there are a number of commercially available models. This should allow the arm to rest in approximately 90° of flexion but should be positioned proximal enough to allow additional flexion to be applied by surgical assistants while working in the anterior compartment (Fig 1 A and B). At this point, standard sterile preparation and

draping is performed, ensuring access is not restricted for the proximal anteromedial and midanterolateral portals (Fig 2).

Accessing the Anterior Compartment

Using these portals, a diagnostic arthroscopy of the anterior compartment is performed with the camera in the proximal anteromedial portal (PAMP). The camera can be positioned upright so that the base is perpendicular to the humerus, in which case the humerus is oriented horizontally on the monitor and the radius

Fig 3. (A) When viewing the anterior aspect of this right elbow in the lateral decubitus position from the proximal anteromedial portal, if the camera is held upright, the humerus will be horizontally oriented on the monitor. (B) If a more anatomical orientation is desired, the camera can be rotated 90° so that the humerus is vertically oriented. (C) Holding the camera in this position, the lateral aspect of the joint is easily visualized and the midanterolateral portal can be created under needle localization.



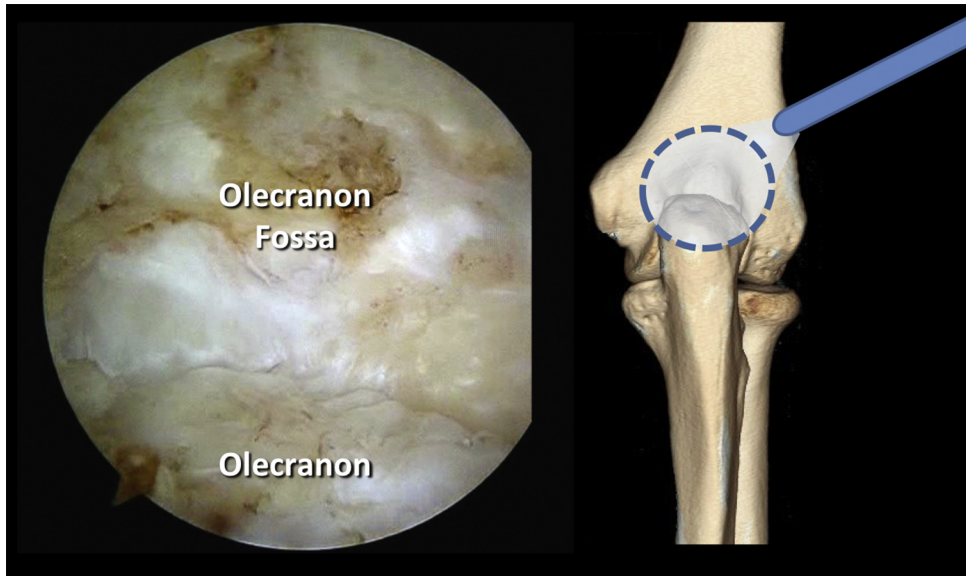


Fig 4. When viewing the posterior aspect of this right elbow positioned in the lateral decubitus position, the camera is inserted into the proximal lateral portal. Viewing from this perspective allows easy visualization of olecranon and olecranon fossa. The medial and lateral gutters can generally be visualized from this portal.

and ulna perpendicular to that (Fig 3A). Alternatively, the base can be rotated 90° so that it is parallel to the humerus, allowing for a more anatomic view with the humerus oriented vertically on the monitor (Fig 3B). From the PAMP, the central and lateral structures are easily visualized, while allowing creation of the mid-anterolateral portal (MALP) with needle localization (Fig 3C). Dynamic assessment with flexion/extension and pronation/supination generally allows adequate visualization of all structures of the radiocapitellar articulation when viewing from the medial side. When viewing from the lateral side (camera in the MALP), the ulnohumeral articulation can easily be identified. Additional portals can be added to facilitate the usage of retraction instruments, and pathology in the anterior compartment can be treated as necessary.

Accessing the Posterior Compartment

Posterior compartment access is typically gained by using the posterolateral portal as a viewing portal and the direct posterior portal as the primary working portal

(Fig 4). During posterior elbow arthroscopy, the working space can be increased with elbow extension. Viewing from the posterolateral portal allows access to the posterior aspect of the radiocapitellar articulation, the ulnohumeral articulation including the olecranon fossa, and the medial gutter. If improved access is required to the medial gutter, the arthroscope may also be positioned in the direct posterior portal. If extensive work is required in the lateral gutter or radiocapitellar articulation, the direct lateral portal can be created in the soft spot of the elbow. If soft-tissue retraction is desired, an intra-articular retractor can be placed proximal to the standard posterolateral portal along the medial border of the triceps. Especially in cases of synovial proliferative disease and hypertrophic osteoarthropathy, intra-articular retraction can significantly improve visualization. Depending on surgeon preference, when viewing the posterior compartment of the elbow, the base of the camera may be positioned distally to maintain an anatomic view or inverted so that the olecranon tip is on the top of the monitor.

Table 2. Common Pearls and Pitfalls for Performing Elbow Arthroscopy With the Patient in the Lateral Decubitus Position

Pearls	Pitfalls
While positioning patient, ensure arm holder is high (proximal) on humerus and anterior compartment is accessible.	If the patient is not properly secured, he or she can drift backwards bringing the antecubital fossa closer to the arm holder, impeding access to the anterior compartment.
Prior to draping, ensure there is plenty of working space on both sides (medial and lateral) of the elbow.	If the humerus is not perpendicular to the body (90° of abduction), medial- or lateral-sided access may be impeded.
In the anterior compartment, the camera can be rotated 90° to anatomically orient the image.	Orientation of the anterior compartment can initially be confusing or paradoxical if surgeon experience is limited.
Use switching stick(s) to change the camera between the medial and lateral sides.	Switching portals repeatedly without a switching stick or cannula can increase the risk of neurovascular injury.
In the posterior compartment, the elbow can be extended to relax the capsule and increase working space.	An assistant is typically required to hold the elbow in extension in order to access the posterior compartment.
Use a retractor through proximal portals as needed.	

Table 3. Equipment Required

Equipment
Bean bag patient positioner (Natus; Pleasanton, CA).
Arm holder
Standard arthroscopy tower and equipment (Stryker Corp.; Kalamazoo, MI)

Discussion

Surgical indications for elbow arthroscopy continue to increase.⁷⁻⁹ While advances in arthroscopic techniques have allowed improved access and better treatment of intra-articular pathology, proper patient positioning remains a key component of the procedure (Table 2). Lateral decubitus positioning avoids the potential downsides of prone positioning, including limited airway access, while offering the advantages of access to both the anterior and posterior compartments and the ability for dynamic motion (flexion, extension, pronation, and supination) and intraoperative assessment of all structures¹ (Table 1). When compared to the supine position, distinct benefits of the lateral decubitus position include no need for a mechanical traction device, free motion of the elbow during surgery, and a more anatomic orientation (especially for the posterior elbow). Conversely, advantages of the supine position include easier patient positioning, optimal airway access for anesthesia, static positioning of the arm without the need of an assistant, and easy conversion to open surgery for the medial or lateral sides of the elbow.^{10,11} If extensive medial-sided open elbow surgery (such as medial ulnar collateral ligament reconstruction) is required, it can be difficult to perform when patients are placed in the lateral decubitus position (Table 1).

Since its description by O'Driscoll and Morrey in 1992,¹ this positioning has been widely used, particularly in the treatment of the arthritic elbow where conversion to open, medial-sided surgery is less common.¹² Our described technique for lateral decubitus

positioning and subsequent portal placement, with accompanying video (Video 1), will hopefully allow for reliable, safe arthroscopic access to the elbow joint for the treatment of a variety of pathologies with minimal equipment required (Table 3).

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